WATERSHED WORK PLAN

FOR WATERSHED PROTECTION AND FLOOD PREVENTION

MILL BRANCH WATERSHED

BACON COUNTY, GEORGIA

4-32142 8-72

USDA SCS-FORT WORTH, TEX. 1974

ADDENDUM

MILL BRANCH WATERSHED, GEORGIA

INTRODUCTION

This addendum is based on the Water Resource Council's "Principles and Standards for Planning Water and Related Land Resources," which became effective October 30, 1973. It is prepared to be consistent with the requirements of the Water Resource Council's Procedure No. 1 for the phase-in of the Principles and Standards. The information presented is:

Part I - Benefits to Cost Comparison

An evaluation of the selected plan using current normalized prices, current construction costs, and the current interest rate.

Part II - Four Account Displays

Evaluated effects of the selected plan are displayed under separate accounts for (1) National Economic Development, (2) Environmental Quality, (3) Regional Development, and (4) Social Well-Being. The Displays are consistent with the intent of the Principles and Standards.

Part III - Abbreviated Environmental Quality Plan

An environmental quality plan, consistent with the intent of the Principles and Standards, but which is abridged in detail, has been developed by an interdisciplinary team. It is an alternative plan to the selected plan and is formulated to enhance environmental quality by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems. This plan was formulated from information and data obtained during the investigative and analysis phases of project planning. Formulation began with the inventory and recognition of the watershed problems and needs. Desired environmental effects, as translated from the problems and needs, provided a basis for examining appropriate water and land resource use and management opportunities. Opportunities that emphasized contributions to the component needs were selected and are shown as plan elements of the abbreviated environmental quality plan. The cost of $4,325,400 for its installation is a preliminary estimate.

Implementation of features of this environmental quality plan would require acceptance by the local people. Adequate legal authorities do exist for installation; however, funding for all plan elements is presently not available through existing legislative authorities.

ADDENDUM

PART 1

Mill Branch Watershed

Georgia

April 1976

The purpose of this addendum is to show the effects of 6 1/8% interest rate.

Annual project costs, benefits and benefit-cost ratio are as follows:

1. Annual Project Cost - $ 77,286
2. Annual Project Benefits - $214,383
3. Benefit-Cost Ratio with Secondary Benefits included - 2.8:1.0
4. Benefit-Cost Ratio without Secondary Benefits - 2.2:1.0

PART II

SELECTED ALTERNATIVE
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT
Mill Branch Watershed, Georgia

Components	Measures of Effects 1/ -Dollars-
Beneficial Effects:	
A. The value to users of increased outputs of goods & services	
1. Flood Prevention	$ 97,266
2. Agricultural Water Management (Improved efficiency)	60,941
3. Utilization of unemployed & under employed labor resources: Project construction and OM&R	12,427
Total Beneficial Effects	170,634

Components	Measures of Effects 1/ -Dollars-
Adverse Effects:	
A. The value of resources required for a plan	
1. Multiple Purpose Channels	
a. Project Installation	$ 53,279
b. Project Administration	6,460
c. Operation & Maintenance	17,547
Total Adverse Effects	77,286
Net Beneficial Effects	93,348

1/ Average Annual

April 1976

SELECTED ALTERNATIVE
ENVIRONMENTAL QUALITY ACCOUNT

Mill Branch Watershed, Georgia

Components		Measures of Effects
Beneficial & Adverse Effects:		
A. Areas of natural beauty.	1.	Project output will make available regional funds and resources that can be used to enhance the physical appearance of 20,600 acres of agricultural and forest land on 179 land units.
	2.	Six surface acres of water created will add diversity to the landscape.
	3.	Project channels will replace 44 acres of forest land.
	4.	Replace six acres of grazed forest land with six surface acres of water.
B. Quality consideration of water, land and air resources.	1.	Reduce gross erosion from all sources from 28,000 tons annually to 17,000 tons annually.
	2.	Reduce sediment concentration carried by runoff water leaving the project area from 38 mg/1 to 34 mg/1.
	3.	Reduce sediment pollution of project area streams.
	4.	Increase rainfall infiltration in the watershed.
	5.	Water quality in intermittent and ephemeral streams will be temporarily lowered during and immediately after construction.
C. Biological resources & selected ecosystems.	1.	Improvement of wildlife habitat for some species in forest areas will result from management practices inducing more diverse and palatable ground vegetation.
	2.	Wildlife food and cover planting on 150 acres will increase food supplies and improve habitat.

SELECTED ALTERNATIVE
ENVIRONMENTAL QUALITY ACCOUNT (Continued)

Mill Branch Watershed, Georgia

Components		Measures of Effects
C.	Biological resources & selected ecosystems (continued)	3. Low spots and dug sediment traps in constructed channels will maintain distribution of water for wildlife.
		4. Stimulate the growth of native plants beneficial to game species of wildlife by removal of excess surface water in forest areas.
		5. Temporarily lower wildlife habitat values on approximately 211 acres now in forest land by clearing operations.
		6. Project channels will replace 44 acres of low value forest land wildlife habitat.
D.	Irreversible or irretrievable commitment.	1. Conversion of 7 acres of open agricultural land and 44 acres of forest land to seasonal aquatic ecosystems in open channels.
		2. Expenditure of labor, materials and energy for construction of project measures.

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT

Mill Branch Watershed, Georgia

Components	Measures of Effects 1/ State of Georgia	Rest of Nation
	-Dollars-	
A. Income:		
Beneficial Effects:		
The value of increased output of goods and services to users residing in the region.		
a. Flood Prevention	97,266	
b. Agricultural Water Management	60,941	
c. Secondary	43,749	
d. Utilization of regional unemployed and under employed labor resources:		
Project Construction and OM&R	12,427	
Total Beneficial Effects	214,383	
Adverse Effects:		
The value of resources contributed from within the region to achieve the outputs.		
a. Multiple Purpose Channels		
Project Installation	14,462	38,817
Project Administration	430	6,030
OM&R	17,547	---
Total Adverse Effects	32,439	44,847
Net Beneficial Effects	181,944	-44,847

1/ Average Annual

April 1976

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT (Continued)

Mill Branch Watershed, Georgia

Components	Measures of Effects	
	State of Georgia	Rest of Nation
B. Employment:		
Beneficial Effects:		
Increase in number and types of jobs.		
a. Agricultural Employment	7.9 permanent skilled and 15.8 permanent semi-skilled jobs.	----
b. Employment for Project Construction	2.8 skilled and 22.5 semi-skilled jobs during installation.	----
c. Employment for Project OM&R	1.7 permanent semi-skilled jobs.	----
Total Beneficial Effects	9.6 permanent skilled and 15.8 permanent semi-skilled jobs. 2.8 skilled and 22.5 semi-skilled jobs during installation.	----
Adverse Effects		
Decrease in number and types of jobs.	-0-	-0-
Total Adverse Effects	-0-	-0-
Net Beneficial Effects	9.6 permanent skilled and 15.8 permanent semi-skilled jobs. 2.8 skilled and 22.5 semi-skilled jobs during installation.	

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT (Continued)

Mill Branch Watershed, Georgia

Components	Measures of Effects State of Georgia	Rest of Nation
C. Population Distribution		
Beneficial Effects:	Create 9.6 permanent skilled, 15.8 permanent semi-skilled, 2.8 skilled, and 22.5 semi-skilled jobs during project installation for a predominately rural area which has experienced a net out-migration of 12.2% in the last 10 years.	------
Adverse Effects:	------	------
D. Regional Economic Base & Stability		
Beneficial Effects:	The project will create 9.6 permanent skilled, 15.8 permanent semi-skilled, 2.8 skilled and 22.5 semi-skilled jobs during project installation in an area which has been classified by the Economic Development Administration as a Title IV area because of severely depressed economic conditions. Low income farmers will be able to improve their economic condition by eliminating inefficiencies in their operations. Increased agricultural production due to project installation will create new demands in agriculturally-related businesses.	------
Adverse Effects	------	------

SELECTED ALTERNATIVE
SOCIAL WELL-BEING ACCOUNT

Mill Branch Watershed, Georgia

Components	Measures of Effects
Beneficial and Adverse Effects:	
A. Real Income Distribution	1. Create 9.6 permanent skilled, 15.8 permanent semi-skilled jobs, 2.8 skilled and 22.5 semi-skilled jobs during project installation.
	2. Create regional income benefit distribution of $214,383 benefits by income class as follows:

Income Class (Dollars)	Percentage of Adjusted Gross Income in Class	Percentage of Benefits in Class
Less than 3,000	26%	30%
3,000 - 10,000	55%	60%
More than 10,000	19%	10%

3. Local cost to be borne by region totals $32,439 with distribution by income class as follows:

Income Class (Dollars)	Percentage of Adjusted Gross Income in Class	Percentage Contribution in Class
Less than 3,000	26%	8%
3,000 - 10,000	55%	55%
More than 10,000	19%	37%

B. Life, Health and Safety

1. Conditions favorable for development of floodwater-type mosquitos will be reduced, thereby improving living conditions for residents.

2. Reduce the isolation of area residents occurring when roads are flooded; essential traffic, such as those seeking medical attention and children going to schools, is delayed by floods under present conditions.

PART III
ABBREVIATED ENVIRONMENTAL QUALITY PLAN

Mill Branch Watershed, Georgia

The components of this environmental quality plan for the Mill Branch Watershed are to preserve or enhance areas of natural beauty; improve the quality of the water, land, and air resources; preserve or enhance the biological resources within the ecosystems of the watershed; and create new and improve existing facilities for health and recreation.

The principal environmental problems in the watershed include the need for the timely disposal of excess surface water that adversely affects quantity and quality of production from land and plant resources associated with intensified agricultural use. This excess surface water poses a threat to health and property and prevents the full utilization of productive areas of the watershed. Lack of recreational facilities are also a problem.

The watershed is in the southeastern section of the state and is a part of the Atlantic and Gulf Coast Lowland Forest and Truck Crop Region as defined by the Water Resource Council. Drainage areas in the watershed are erratic and poorly defined. This condition, compounded by flat topography creates flooding and poor drainage problems on agricultural and forest land. Native vegetation consists principally of mixed pine and hardwoods with an understory of water tolerant shrubs; including gallberry, wax myrtle, and palmetto. Approximately 10 acres of critically eroding areas exists in the watershed. These areas are small, scattered plots located in the slightly rolling, north central section of the project.

Wildlife habitat quality in the watershed is low and fish habitat quality is very low. There is a need for food and cover plantings, prescribed burning of woodlands, and establishment of mast-producing species of oaks, such as water oaks, laurel oak and sawtooth oak. Few ponds exist in the watershed. Therefore, pond construction and improvement of existing lakes are needed to provide good fisheries habitat, an aquatic ecosystem, wildlife watering facilities, and areas for wholesome family type outdoor recreation.

There are firm plans by the government of Bacon County to construct a recreational lake of approximately 1,800 acres with a beach, nature trails, a golf course, camping sites, fishing piers, marinas, and sanitary facilities. This development will not be within the watershed boundary, but will be within close access for people within the watershed.

Flooding of fields, roads, driveways, yards and gardens is responsible for inconvenience and general disruption of daily routines. High water

and generally wet conditions are largely responsible for insect pests that affect the well-being of residents. No loss of life has been attributed to floods in the watershed.

Component needs for solving problems relating to specific environmental conditions are listed below.

1. Areas of Natural Beauty:

    a. Reduce critical area erosion that exists in the rolling upland portions of the area.
    b. Maintain the diversity of the landscape.
    c. Improve vegetative practices in cultural areas.

2. Quality of water, land and air resources:

    a. Improve the surface drainage of saturated areas in the watershed that will relieve problems on agricultural and forest lands.
    b. Prevent future floodwater damage to roads and houses.
    c. Prevent pollution of streams from agricultural chemicals used in the future.
    d. Maintain or enhance the productivity of the land resource base.
    e. Provide water-based family recreation and increase water supply for the area.
    f. Improve quality of the air by reducing the dust associated with dirt and gravel roads.

3. Biological Resources and Ecosystems:

    a. Enhance the fisheries habitat.
    b. Provide more close growing vegetation such as grasses or legumes for ground feeding wildlife.
    c. Establish more watering facilities for wildlife.
    d. Create additional cover for wildlife by vigorous vegetative growth resulting from proper drainage of excessively wet areas.
    e. Promote well being of the watershed inhabitants by improving man's environment in the area.
    f. Provide needed outdoor recreation opportunities for area residents.
    g. Reduce flooding of breeding areas that cause mosquito problems for people, livestock, pets, and wildlife.
    h. Provide outlets for water that otherwise would innundate yards which can cause problems and be detrimental to health.

Practices needed to improve environmental quality consist of structural measures and conservation land treatment. Land treatment measures for

cropland will include Conservation Cropping System (growing crops in combination with needed cultural and management practices), minimum tillage, crop residue management, land smoothing and water disposal systems (grassed waterways, subsurface drains, and shallow field drainage laterals).

Land treatment for grassland will consist of pasture and hayland planting and management to provide soil protection, reduce water runoff, maintain or improve quality and quantity of forage and prolong the life of desirable forage species. Eroding areas will be stabilized by grading, shaping, liming, fertilizing, seeding and mulching. Better management practices will be implemented on 23 existing ponds to make them more attractive for family recreation and to provide better habitat for game, fish, and shore birds.

In order to realize the maximum benefit from the forest land, the land must be placed under proper management. This will include the preparation of 130 multiple use management plans, the planting of 1,860 acres of trees in understocked areas and the improvement of 2,940 acres by other cultural practices, such as thinning and improvement cuttings. Food-producing species will be included in tree plantings for benefit of wildlife.

Approximately 229,500 feet of multiple purpose channels for flood prevention and agricultural forest water management are to be installed. Floodwater and drainage outlets for agricultural and pine forest land will be provided for all farms with such a need that do not have existing outlets within the confines of farm boundaries.

This plan provides for paving of 75 miles of county dirt roads to eliminate the dust pollution caused by vehicle movement. Fifteen ponds, averaging one acre in size, will be constructed to provide more watering facilities for livestock and wildlife and to provide needed rural family recreation in the watershed. Fishing sites in the watershed are presently limited because of the lack of water during dry periods.

The elements included in this plan would be implemented by participation and funding from individuals and local city, county or state governments. Cost sharing through various federal programs may be utilized in installation.

The estimated installation cost of the elements of the Environmental Quality Plan are as follows:

1. Conservation Land Treatment

a. Cropland	$ 202,200
b. Pastureland	35,600
c. Forest land	96,800
d. Miscellaneous land	1,200
e. Going Coop. Forest Mgt. Prog.	3,700
f. Going Coop. Forest Fire Cont. Prog.	19,400
g. Critical Area Stabilization Field Planting	3,000
h. Technical Assistance	65,900
Total Land Treatment	$ 427,800

2. Structural Measures

a. Multiple purpose channels	$ 867,600
b. Fifteen ponds	30,000
c. Paving 75 miles of county roads	3,000,000
Total Structural Measures	$3,897,600
GRAND TOTAL	$4,325,400

The environmental effects that would result from installation of the environmental plan are as follows:

1. Areas of Natural Beauty

a. Project output will make available regional funds and resources that can be used to improve the physical appearance of 170 farms on about 19,000 acres.
b. Create 15 surface acres of water for diversity of landscape.
c. Reduce sediment production in the watershed by approximately 11,000 tons annually.
d. Approximately 7 acres of cropland and 44 acres of forest land will be replaced by new channels.
e. Approximately 15 acres of forest land and related timber production will be lost to inundation by pond construction as part of the conservation land treatment program.

2, Quality Considerations of Water and Land Resources

a. Reduce flooding and improve the drainage facilities on 5,415 acres of agricultural and pine forest land located on 153 separately-owned land units.
b. Road damage from flooding and extended periods of saturation will be reduced by 70 percent.
c. Water quality in intermittent and ephemeral streams will be degraded during and immediately after construction.
d. Disposal of construction debris consisting of limbs, brush, stumps and small trees will be in accordance with state solid waste regulations. If burned, a temporary lowering of the ambient air quality will result.

e. Temporary loss of forest production will occur on about 211 acres cleared for channel right-of-ways and later re-planted to grass and trees.

3. Biological Resources and Selected Ecological Systems

a. Improvement of wildlife habitat for some species in pine forest areas will result from management practices inducing more diverse and palatable ground vegetation. Wildlife food and cover planting on 150 acres will increase food supplies and improve habitat in local areas.
b. Ponds, low spots in constructed channels and dug sediment traps will maintain distribution of water for wildlife during seasonal droughts.
c. Conditions favorable for development of floodwater-type mosquitos will be reduced, thereby improving living conditions for residents.
d. Approximately 44 acres of forest wildlife habitat for some species will be converted to seasonal aquatic ecosystems in new channels creating diverse habitat.
e. Forest wildlife habitat will be degraded by clearing approximately 211 acres of rights-of-way which will be re-vegetated. New vegetation will include plants beneficial to significant game species and other wildlife.
f. Management of existing and newly constructed ponds will provide 600 man-days of fishing per year.

4. Irreversible or irretrievable Commitments of Resources

a. Approximately 44 acres of forest land will be converted to seasonal aquatic ecosystems in canals.
b. Labor, energy and materials used in planning and construction.
c. Fifteen acres of forest land will be replaced by water in pond construction.

WATERSHED WORK PLAN AGREEMENT

between the

Altamaha Soil and Water Conservation District
Bacon County

(hereinafter referred to as the Sponsoring Local Organization)

State of Georgia

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan for works of improvement for the Mill Branch Watershed, State of Georgia, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; 68 Stat. 666), as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the Mill Branch Watershed, State of Georgia, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about five years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The sponsoring Local Organization will acquire with other than PL-566 funds, such land rights as will be needed in connection with the works of improvement. (Estimated cost, $60,100.)

2. The Sponsoring Local Organization assures that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

Sponsoring Local Organization (percent)	Service (percent)	Estimated Relocation Payment Costs (dollars)
44.4	55.6	0 1/

3. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State Law as may be needed in the installation and operation of the works of improvement.

4. The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

Works of Improvement	Sponsoring Local Organization (percent)	Service (percent)	Estimated Construction Cost (dollars)
Multiple-Purpose Open Channels	25	75	701,600

(1) The Sponsors will provide a portion of their share of costs of multiple-purpose open channels by accomplishing a specified amount of construction, and

1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with the percentages shown.

(2) The quantity and value of such work will be determined by mutual agreement immediately prior to signing of the appropriate agreement and will be set forth in the project agreement.

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organization and the Service are as follows:

Works of Improvement	Sponsoring Local Organization (percent)	Service (percent)	Engineering Costs (dollars)
Multiple-Purpose Open Channels	0	100	105,900

6. The sponsoring Local Organization and the Service will each bear the costs of Project Administration which it incurs, estimated to be $7,000 and $98,200, respectively.

7. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

8. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

9. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

10. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

11. This agreement is not a fund obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the availability of appropriations for this purpose.

A separate agreement will be entered into between the Service and the Sponsoring Local Organization before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

12. The watershed work plan may be amended or revised, and this agreement may be modified or terminated only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties. An amendment to incorporate changes affecting one specific structural measure may be made by mutual agreement between the Service and the Sponsor(s) having specific responsibilities for the particular structural measure involved.

13. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

14. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 C.F.R. 15.1-15.2), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving federal financial assistance.

15. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

16. The Sponsoring Local Organization will furnish all labor and equipment and perform all work required to prepare seedbeds, fertilize, plant, seed, and mulch the land treatment measures designated as critical area stabilization (field) which is considered the Sponsoring Local Organization's cost for this measure. The Service will provide funds for the purchase of fertilizer, seed, plants, and mulch.

ALTAMAHA SOIL AND WATER
CONSERVATION DISTRICT
P.O. Box 326
Baxley, Georgia 31513
Address Zip Code

By Jimmy E. Mayers
Jimmy E. Mayers
Title Chairman
Date 5/18/76

The signing of this agreement was authorized by a resolution of the governing body of the Altamaha Soil and Water Conservation District adopted at a meeting held on 4/26/76.

A. R. Tuten
A. R. Tuten, Secretary

P.O. Box 326 - Baxley, Georgia 31513
Address Zip Code

Date 5/18/76

COUNTY GOVERNMENT
OF BACON COUNTY

P.O. Box 356, Alma, Ga. 31510
Address Zip Code

By Wesley Johnson
Wesley Johnson
Title Chairman
Date 5-18-76

The signing of this agreement was authorized by a resolution of the governing body (Board of Commissioners) of Bacon County adopted at a meeting held on May 18, 1976.

Marguerite Boatright
Marguerite Boatright
Clerk-Treasurer

P.O. Box 356, Alma, Georgia 31510
Address Zip Code

Date 5-18-76

Appropriate and careful consideration has been given to the environmental impact statement prepared for this project and to the environmental aspects thereof.

Soil Conservation Service
United States Department of Agriculture

Approved by:

Dwight M. Treadway
Dwight M Treadway
State Conservationist

May 18, 1976
Date

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WATERSHED WORK PLAN

MILL BRANCH WATERSHED

Bacon County, Georgia

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666), as amended.

Prepared by:

County Government of Bacon County
Altamaha Soil and Water Conservation District

With assistance by:

U. S. Department of Agriculture, Soil Conservation Service

U. S. Department of Agriculture, Forest Service

April 1976

WATERSHED WORK PLAN

MILL BRANCH WATERSHED

Bacon County, Georgia

April 1976

SUMMARY OF PLAN

The Mill Branch Watershed is an area of approximately 21,319 acres located in Bacon County, Georgia. The watershed is in the southeastern section of the state and is a part of the Atlantic and Gulf Coast lowland forest and truck crop region as defined by the Water Resources Council.

Sponsoring Local Organizations are Bacon County and the Altamaha Soil and Water Conservation District.

The most important watershed problems covered by this plan consist of (1) correcting flooding and poor drainage which adversely affect cropland, pastureland, pine forest land, and county roads; and (2) accelerating conservation land treatment of agricultural land.

Land use in the watershed has approximately the following distribution: 13,164 acres (62 percent) forest land, 6,290 acres (30 percent) cropland, 715 acres (3 percent) pastureland, 690 acres (3 percent) urban land, and 460 acres (2 percent) in other uses. Land in the problem areas is used for corn, tobacco, soybeans, pasture, hay, truck crops, and pine forest.

Works of improvement to be installed consist of proper conservation land treatment measures to be applied on approximately 5,000 acres of crop and pastureland, 80 acres of miscellaneous land, 10 acres of critical areas, and 4,800 acres of forest land. Wildlife management measures will improve wildlife habitat on approximately 150 acres. Structural measures to be installed consist of approximately 229,500 feet of multiple purpose open channels for flood prevention and agricultural and pine forest water management.

Conservation treatment of agricultural land will consist of installing such measures as conservation cropping systems, water disposal systems, minimum tillage, land smoothing, crop residue use, pasture and hayland planting and management. Management of existing ponds will be improved and new ponds will be constructed by landowners for fish production and recreation and for better grazing distribution. Plantings for wildlife food and cover will be made in openings in forested areas and in corners and edges of cultivated fields. Field critical areas will be vegetated with grasses, legumes, and adapted varieties of oak trees useful for wildlife food. Treatment of forest land will consist of planting trees in understocked areas, thinning and improvement cutting, installing water disposal systems, and improving fire control. Tree plantings will include several species of oaks suitable for wildlife food production.

Planned structural measures consist of multiple purpose open channels for flood prevention and agricultural and forest water management. Floodwater and drainage outlets, for agricultural and pine forest land, will be provided for 153 farms that do not have existing outlets within the confines of farm boundaries. Channels will be excavated to 1/2:1 side slopes except in short sections where flatter slopes are needed for aesthetic purposes. Channel dimensions and other descriptive data are shown on Table 3. Table 3B lists classification of drainageways. With the exception of 0.3 miles of natural channels and 2.5 miles of man-made ditches, the channel work will be done where no well defined channels exist. Flow conditions are ephemeral on 31.3 miles proposed and intermittent on the remaining 9.3 miles.

Favorable environmental effects are summarized as follows:

1. Gross erosion will be reduced by approximately 11,000 tons annually; aesthetics of the area and farming efficiency will be improved.
2. Annual sediment yield will be reduced by 100 tons.
3. Ponds will be managed more efficiently for fish production and family recreation.
4. Approximately 5,415 acres of agricultural and pine forest land located on 153 farms will be protected, thereby reducing damages by 70 percent or from about $140,236 to $42,070 annually. Additional benefits of approximately $60,941 annually will be attributable to improved drainage.
5. Annual maintenance costs of secondary roads will be reduced by $28,300.
6. Wildlife habitat on 150 acres will be improved by planting food and cover plants.
7. Floodwater-type mosquito populations will be reduced.
8. New jobs will be created and the local economy stimulated.
9. Reducing excess surface water will allow prescribed burning of pine forest land, which in turn will reduce the probability, size, and intensity of wildfires with associated air pollution. Prescribed burning will improve vector control and wildlife habitat.

Adverse environmental effects are summarized as follows:

1. Approximately 7 acres of cropland and 44 acres of forest land will be replaced by project channels.
2. Forest land wildlife habitat on 211 acres will be degraded by clearing rights-of-way.
3. A shift to a less wet condition on improved pine forest areas may increase the fire hazard in areas where prescribed burning has not been done.
4. Water quality in intermittent and ephemeral streams will be temporarily degraded during and immediately following construction.
5. Approximately 6 acres of forest land will be replaced by farm ponds expected to be constructed by landowners.

The estimated project installation period is five years.

The conservation land treatment program, including soil surveys, is estimated to cost $427,800, with $49,400 coming from PL-566 funds and $378,400 from other sources (Table 1).

Structural measures are estimated to cost $972,800 with $730,300 coming from PL-566 funds and $242,500 from other sources (Table 2).

Total estimated project installation cost is $1,400,600, with $779,700 coming from PL-566 funds and $620,900 from other sources (Table 1).

Individual landowners will operate and maintain conservation land treatment practices in accordance with the District Cooperator Agreement contained in their conservation plan. The Bacon County government will operate and maintain structural measures in accordance with operation and maintenance agreements with the Soil Conservation Service. The estimated average annual operation and maintenance cost of structural measures is $17,547.

Average annual benefits evaluated for project justification amount to $214,383. Average annual cost is estimated to be $77,286. The benefit-cost ratio is 2.8:1 (Table 6).

WATERSHED RESOURCES - ENVIRONMENTAL SETTING

Physical Resources

The Mill Branch Watershed with a drainage area of 21,319 acres, is located in Bacon County in southeast Georgia. Alma, population 3,750, is the county seat of Bacon County; and it is located on the east boundary of the watershed. Waycross, population 19,000, is located thirty-two miles south of Alma; and Douglas, population 10,195, is twenty-two miles west. The watershed population is approximately 2,750, with 1,650 of these residing in Alma and 1,100 in rural areas.

The watershed, a part of the Satilla River Basin, is located in the South Atlantic Gulf Land and Water Resource Region. This region encompasses twenty-four distinct river systems and numerous minor systems draining an area of approximately 276,000 square miles. Its average annual runoff of 197 billion gallons per day (bgd) is the third highest in the United States. Anticipated population and economic growth throughout the region will heighten demands for prudent management of water and related land resources in the future.1/

The watershed is a part of the Atlantic and Gulf Coast Lowland Forest and Truck Crop Subregion, an area characterized by poorly drained flatlands underlain by productive aquifers. Streams in the subregion are typically unreliable for water supply, and few reservoir sites exist. The watershed is similar to the subregion in these respects.

With the exception of a four square mile area north of Alma, of which a portion is within the city limits, and the lower southwest section of the watershed, most drainage patterns are erratic and poorly defined. This condition compounded by very flat topography creates a flooding and poor drainage problem on approximately 5,415 acres of agricultural and pine forest land. Water courses are dry during periods of low rainfall. Typically, these water courses or drainageways are wide and flat. Intermittent and ephemeral flow moves through these areas at random.

Average annual rainfall in the watershed is about 46.6 inches. July is normally the wettest month with 5.7 inches and November the driest with 2.2 inches. Temperature averages about 66 degrees for the year, ranging from around a 50 degree average in January to around 81 degrees in July. The freeze free growing season averages about two hundred fifty days, extending usually from early March to just past mid-November.2/

Topography of the watershed is flat to gently rolling with elevations ranging from a high of about 220 feet above mean sea level (msl) in the northwest part, to 136 msl at the outlet. The principal geologic formation

1/ "The Nations Water Resources," Water Resources Council, Washington, D. C., 1968, Chap. 2, pp. 1-4.

2/ "Climatological Data - Annual Summary 1975," Volume 79, No. 13, U.S. Department of Commerce National Oceanic and Atmospheric Administration, Environmental Data Service.

underlying the watershed is the Hawthorne. This formation is considered to be Miocene in age, with the upper member consisting of interbedded sands and sandy clay. Most soils in the watershed were formed from this material.

A series of limestone formations underlie the Hawthorne, ranging in age from Miocene to Upper Eocene. Collectively, these limestone beds form what is called the principal artesian aquifer of the Coastal Plain. Most water for domestic and industrial uses in the area is supplied from this aquifer which lies at a depth of 360 feet in the vicinity of the Alma city well. The watershed is not considered a major recharge area for the aquifer.3/ Recharge of the principal artesian aquifer by surface water occurs in areas in which the aquifer is at or near the surface. Some recharge also occurs in areas in which the aquifer is connected with the surface by a series of solution cavities known as sinkholes. The outcrop region for the aquifer comprises an area approximately 40 to 100 miles wide, that lies parallel to and south of the fall line. This region is widest in the southwest corner of the state, where there is extensive karst topography, with solution cavities penetrating to the aquifer. The other karst area is confined primarily to Lowndes County along the southern boundary of the state.

Remnants of two Pleistocene shorelines are also present in the watershed. The lower shoreline is the Okefenokee, which extends from elevation 100 to 150 feet msl and is confined to the lower extremity of the project below the confluence of Mill Branch and Big Branch. The upper shoreline, the High Terrace, extends from elevation 150 msl to the highest elevation in the watershed. Most of the project falls within the confines of this terrace, which is poorly defined, and consists only of scattered terrace remnants. 4/

The watershed consists of approximately 16 percent upland and 84 percent lowland. Principal upland soils include the Tifton, Gilead, Lakeland, and Norfolk series. Upland soils occur on slopes ranging generally from 0 to 8 percent, have low to moderate water holding capacity, are low to moderate in natural fertility, are strongly acid, and are low in organic matter content. Tifton is the most important upland soil with respect to intensive agricultural use, and consists of well drained soils formed in thick beds of sandy clay loam and sandy clay materials.

The principal lowland soil series are Goldsboro, Leefield, Lynchburg, Olustee, Pelham, Plummer, and Rains. These soils characteristically

3/ Stephen M. Herrick and Robert C. Vorhis. "Subsurface Geology of the Georgia Coastal Plain," Georgia department of Mines Mining and Geology, Information Circular 25, 1963, p.277.

4/ F. Stearns MacNeil, "Pleistocene Shore Lines in Florida and Georgia," Geological Survey Professional Paper 221-F, 1950, pp. 98-102.

occur on slopes ranging from 0 to 2 percent, have a high water holding capacity, are low in natural fertility, are strongly acid, and are low to medium in organic matter content. Goldsboro, Olustee, Leefield, and Lynchburg are the most important of these for intensive agricultural purposes, and consist of deep, poorly drained, nearly level to level soils formed from thick beds of marine sand and loamy sand. Pelham, Plummer and Rains are not as well suited to intensive agriculture as Olustee, Goldsboro, Leefield and Lynchburg, but can be used for pasture. Primary use of lowland soils is forest with the exception of Goldsboro, Olustee, Leefield, and Lynchburg series.

The watershed soils have been classified with respect to agricultural use adaptations and treatment needs into the following capability classes.

Class IIe - 161 acres. Typical of this classification are deep, well drained moderately permeable upland soils of the Norfolk and Tifton series. Slopes range from 2 to 5 percent. A moderate erosion hazard exists when soils in this category are cultivated. Some soils in this capability class require drainage for crop production.

Class IIIe - 191 acres. This capability class is composed of well drained, moderately permeable soils of the Tifton and Gilead series. Slopes range from 2 to 8 percent. A moderate to severe erosion hazard exists when soils in this class are cultivated.

Class IVe - 780 acres. This capability class is composed of well drained, moderately permeable soils of the Tifton and Gilead series. Slopes range from 5 to 8 percent. A severe erosion hazard exists when soils in this class are cultivated. Most of the acreage is in forest and grass.

Class IIs - 1,946 acres. The Norfolk series typifies this capability class. Permeability is moderately rapid and slopes range from 0 to 2 percent. On long, gently sloping fields, wind and water erosion is a slight hazard.

Class IIIs and VIIs - 307 acres. These capability classes are composed of excessively drained, rapidly permeable soils of the Lakeland series. Slopes range from 2 to 5 percent. These soils are droughty and large fields are subject to wind erosion.

Class IIw - 537 acres. This capability class is represented by poorly drained soils of the Leefield, Lynchburg and Goldsboro series. Water moves rapidly through the surface layer and slowly through the subsoil. Slopes range from 0 to 2 percent. Some type of drainage and protection from infrequent flooding is necessary if these soils are farmed successfully.

Class IIIw - 6,231 acres. Poorly drained soils of the Olustee series are typical of this classification. Water moves through the surface at moderate to rapid rates. Slopes range from 0 to 2 percent. Hazards consist of periodic flooding and wetness. The water table is at or near the surface during rainy periods.

Class Vw - 8,523 acres. This class is composed of nearly level, poorly drained and very poorly drained soils. Frequent flooding occurs and water stands at or near the surface for long periods. Plummer and Rains are the series typical of this class.

Class VIIw - 1,797 acres. This class is generally referred to as swamp land. It is composed of nearly level, very poorly drained soil that is frequently flooded. Some of these soils are covered with water for long periods in spring and early summer.

Approximately 690 acres of urban land and 156 acres of land in ponds are unclassified, and constitute the balance of the watershed area.

Land uses for the watershed as a whole, and for the water problem area are summarized in the following table.

Land Use	Watershed		Water Problem Area	
	Acres	Percent	Acres	Percent
Forest land	13,164	62	11,841	69
Cropland	6,290	30	3,836	23
Pastureland	715	3	673	4
Urban & built up	690	3	552	3
Miscellaneous	460	2	152	1
Total	21,319	100	17,054	100

Land in the water problem areas is used for production of corn, tobacco, soybeans, vegetables, beef cattle, and forest products.

There is no mining activity of importance in the watershed. Ground water is available in ample quantities and of acceptable quality for domestic and industrial use. The city of Alma has a municipal water system with a pumping capacity of two million gallons per day. Sources of supply for the system are three deep wells that penetrate the principal artesian aquifer underlying the southeastern coastal plains of Georgia. Total yield of the three wells is approximately 1,500 gallons per minute. County residents are dependent upon individual wells for domestic supply.

Principal characteristics of streams in the watershed are as follows:

Stream	Length (miles)	Bottom Width (feet)	Bank Side Slope	Channel Depth (Feet)	Channel Bottom Material	Channel Type	Flow Characteristics
Big Branch 1/	1.3	10-20	1:1	3-4	organic silt & fine sand	N	I
Mill Branch (313+00 to 347+00)	0.6	4-8	1:1	2-3	sand	N	I

Principal characteristics of streams in the watershed - (continued)

Stream	Length (miles)	Bottom Width (feet)	Bank Side Slope	Channel Depth (Feet)	Channel Bottom Material	Channel Type	Flow Characteristics
Mill Branch[1/] (347+00 to Big Branch)	1.8	8-12	1:1	3-4	sand	N	I
Bear Branch[1/] (Lake Lure to Hurricane Cr.)	0.5	4-8	1:1	2-4	silty sand	O	I
15 M (171+00 to 174+00)	0.1	4	0.5:1	2	sand	M	E
33 M (285+00 to 313+00)	0.5	8-10	1:1	2	sand	M	E
35 M (250+00 to 313+00)	1.2	4-10	1.5:1 to 2:1	1-4	sand	M	E
5 R (388+00 to 423+00)	0.7	2-4	2:1	3-4	sand	M	I

All others - no defined channel.

1/ Not in water problem area.

Legend:

Channel Type
- N - Natural Channel
- M - Man-made ditch
- O - None or practically no defined channel

Flow Characteristics
- E - Ephmeral
- I - Intermittent

With the exception of man-made ditches and about 0.6 miles of Mill Branch, located about 2,000 feet downstream from Highway 32, stream channels in the watershed are poorly defined or non-existent. Vegetation along watercourses generally consists of pure pine stands or pine with mixed hardwoods with an understory of gallberry, myrtle and other brushy species. An exception to this is the lower reaches of Mill Branch and Big Branch where hardwoods are the predominant vegetation.

In addition to streams, about 23 ponds are present in the watershed. These ponds range in size from one to 59 acres, and collectively cover 156 acres. Wells provide a dependable source of water for farm, household, and municipal use.

The major watercourse, Mill Branch, originates in the northwestern edge of the watershed and extends in a southeasterly direction for a distance of approximately 11 miles to its confluence with Rigdon Branch. From this point for a distance of 3.5 miles to Little Hurricane Creek, the stream is called Big Branch. No water quality classification has been established for streams in the watershed. The University of Georgia made an analysis of water quality in Hurricane Creek at a point about one mile from the watershed in December 1972. The results of this analysis were as follows: Temperature 16 degrees C; dissolved oxygen 8.2 mg/1; pH 5.5; color 140 P-C units; total iron 0.45 mg/1; turbidity 25 JTU; alkalinity 5 mg/1; and hardness 15 mg/1. Total N, NO_3 and PO_4 were at levels below the instrument's detection capability. The Hurricane Creek and Mill Branch drainage area characteristics are quite similar except for size. Present annual suspended sediment in water flowing from the watershed is about 38 mg/1.

The wetlands as defined in "Wetlands of the United States", Circular 39 published by Fish and Wildlife Service, U.S. Department of the Interior, were remapped in January 1976. The total acreages are:

Type III -	4.5 acres
Type IV -	20.0 acres
Type V -	15.4 acres
Type VI -	48.5 acres
Type VII -	703.7 acres

Upland agricultural plant communities consist of widely dispersed fields of agronomic crops common to the area. These include corn, soybeans, tobacco, and vegetable crops. Corn is the most important crop. Approximately 58 percent of the upland is used for these crops. Average size of fields is 25 acres. Virtually all farms include upland forest tracts averaging 10 acres in size. These forested tracts are well dispersed and intermingled with cultivated land and pastureland.

Lowland fields used for cultivated crops average 35 acres in size. These fields are also well dispersed and intermingled with lowland forested tracts which average 150 acres in size. Two large tracts of lowland forest are also generally surrounded by agricultural lands. These tracts of approximately 500 acres each are located north of the confluence of Hog and Mill branches and just below the last farm pond on the main stem of Mill Branch.

The forest types are primarily pine and pine mixed with wetland hardwoods. Nearly pure hardwood stands occur along some of the main drainageways. Pine plantations are numerous and scattered throughout the watershed. The principal pine species are slash, longleaf, loblolly, and pond pines. The principal hardwood species are water and willow oaks, sweetgum, yellow poplar, red maple, black gum, and a variety of minor species associated with these types.

Brief descriptions of three of the most common non-agricultural plant communities that are easily recognizable and their relationship to the ecosystem of which they are a part are as follows:

1. Slash and loblolly pine trees are growing mostly on land formerly cultivated. These areas provide income to the owners and furnish escape cover and solitude for some species of wildlife. For the first few years after planting, greenbriers, blackberry plants, common lespedeza, beggar lice, and a host of other plants provide food and cover for birds and animals. As the trees grow larger, this understory of plants is lessened to various degrees dependent upon site condition and uniformity of tree stands. Management practices now employed such as rotation harvest followed by mechanical site preparation prior to replanting, prescribed burning, and control of excess water, all stimulate reproduction of many grasses and legumes essential to the welfare of many living things. This type of plant community represents approximately 95 percent of the upland forest.

2. Mixed stands of predominantly slash, loblolly, and pond pines with scattered cypress, sweet gum, water oaks, willow oaks, yellow poplar, red maple, and black gum with an understory of gallberry, palmetto, and myrtle are located at lower elevations than most pine plantations and agricultural land. Most of this type of plant community is on land too wet for productive timber stands of good quality. Generally, the low productivity and limitations imposed by wet soils discourage management and even fire which Odum describes as an ecological tool of great value when properly used on forest lands.5/ These plant communities, which constitute a major portion of the forest land problem areas, occur in the upstream reaches of the watershed and along drainageways. Most project channel construction will be in or in close proximity to these areas, since they are slightly lower in elevation than most agricultural land also in need of protection. The larger of these areas are referred to locally as pine flats. Pine and hardwood species prevalent in the area and understory growth show a remarkable increase in productivity and quality with minimum water control measures installed.

These non-agricultural plant communities are too wet in their natural state to provide worthwhile economic returns in forest projects or to grow wildlife food of high quantity and variety. In this watershed, these plant communities can be identified as transition areas upstream from or at slightly higher elevations than predominately hardwood areas. These areas do provide low value wildlife habitat for most native species. A potential exists for improving this habitat for some species of wildlife and for production of hardwood and pine forest products.

3. Predominantly hardwood stands occur along the frequently flooded lower reaches of Big Branch, Mill Branch from State Highway 64 to its confluence with Big Branch, and the lower reaches of Rigdon Branch. Principal species in these stands are red maple, blackgum, bay, some water oak, and scattered pines. These thickly forested areas of

5/ Eugene P. Odum, "Fundamentals of Ecology, W. B. Saunders Company, 1971, pp. 131-137.

predominantly water tolerant tree species are below the outlets for proposed channel work. These areas show no ill-effects from the wide range of periodic floods experienced.

Economic Data

The agricultural economy of the watershed derives from full-time family type operations. There is no federal land within the watershed. The state has a small acreage in road rights-of-way. Local government facilities and schools occupy relatively few acres. All of the forest land is in private ownership; large industrial companies own approximately 1,800 acres, and the rest is in small holdings.

The major farm products are poultry, beef, and row crops. There are 179 landownerships (averaging about 115 acres in size) distributed throughout the watershed. Census defined farms average 184 acres in size. Approximately 84 percent of the farms within the project are owner-operated, and 16 percent are tenant operated. About 60 percent are full time and 40 percent are part time farm operations.

The major crops grown are corn, soybeans, tobacco, and vegetables. Vegetables account for a minor portion of farm sales, but they are important to each farm family as a food source. Corn and soybeans comprise 95 percent of the cropland acreage, and corn yields average eighty bushels per acre. Soybean yields are about 20 bushels per acre. Tobacco, which makes up four percent of the cropland acreage, has an average yield of 2,200 pounds per acre. Vegetables account for one percent of the cropland acreage. The primary vegetable crop is sweet corn with yields of about 500 dozen ears per acre. In the problem areas, under present conditions, field corn yields about 60 bushels per acre, soybeans yield 16 bushels per acre, and tobacco yields 1,800 pounds per acre. The average pasture yield is 300 pounds of beef per acre, but in problem areas the yield is only 200 pounds per acre.

According to local officials, the value of agricultural land depends upon several factors: location, crop allotments, soil types, and severity of excess water problems. The estimated value of Class IIw land is from $250 to $300 per acre; IIIw, $200 to $250 per acre; IVw, $80 to $130 per acre; and Vw, $40 to $60 per acre. The value of a lot within the city limits of Alma is estimated to be $1,500.

Transportation facilities within the project area consist of an excellent system of state and federal highways and county farm-to-market roads. Georgia Highway 32 traverses the watershed in an east-west direction. Georgia Highway 64 and U.S. Highways 1 and 23 cross the project in a north-south direction.

The sale of crops including nursery products and hay accounts for 32 percent of the farm income. Livestock and poultry products account for 65 percent, and horticulture and forest products account for 3 percent.

Agricultural employment in Bacon County is steadily declining because of advancing technology which causes a decrease in the demand for labor. Conversely non-agricultural employment is steadily increasing. These trends are exhibited in the following tabulation labeled Average Annual Work Force Estimates (Bacon County). Off farm employment opportunities within the project area is very limited. Some employment opportunities can be found in nearby Waycross and Douglas which are within a reasonable commuting distance. The 1972 unemployment rate for Waycross (3.5 percent) and Douglas (3.2 percent) is below the state average (3.7 percent) which indicates that unemployment in these cities is not serious.

The following tabulation exhibits that during this same period the county unemployment rate was 2.7 percent.

Average Annual Work Force Estimates (Bacon County)[1/]

Employment Status	1969	1970	1971	1972
Civilian work force	2,980	3,050	3,010	3,000
Employed	2,890	2,940	2,900	2,920
Agricultural	630	550	510	510
Non-agricultural	2,260	2,390	2,390	2,410
Wage and salary, except domestic	1,780	1,910	1,910	1,930
Unemployed	90	110	110	80
Unemployment rate	3.0	3.6	3.7	2.7
State Average	2.9	3.6	3.9	3.7

1/ "Georgia Annual Average Work Force Estimates By Area, 1969-1972," May 1973, Georgia Department of Labor, Employment Security Agency, p. 7.

The 1970 Bacon County per capita income of $2,311 was 31 percent below the state average and 41 percent below the national average. The median income of $5,323 was 35 percent below the state average.[6/]

Data from the 1969 Census of Agriculture shows that the average age of farmers in the project area is 48.7 years. There are 25 farmers under 35 years of age. Of these, 5 are under 25 years of age. These statistics indicate that the family farms are under father and eventually son management.

The watershed is located in a designated Rural Development Area, and it is eligible for all programs under the Economic Development Administration. The watershed is also included in the Alma-Bacon County Model Cities Program. It is also in the area administered by the Southeast Georgia Area Planning and Development Commission.

6/ "County and City Data Book, 1972," U. S. Bureau of the Census, U. S. Printing Office, Washington, D.C., 1973, Library of Congress Card No. 52-4576.

Fish and Wildlife Resources

Data for the fish and wildlife resources of the Mill Branch Watershed was derived from a field study report made in April 1970 by the USDI, Fish and Wildlife Service.

Wildlife habitat in Mill Branch Watershed generally is of low quality. Practically all of the cleared land is being used by landowners who practice clean till farming. As a result, food and cover in the fields are scarce, and edge-type habitat is minimized. Forest cover on the upland is primarily pine, usually even-aged in varying size tracts. Where there is an understory, it is composed primarily of gallberry and myrtle. Areas that remain wet because of topography or poor internal drainage are characterized by cypress, gum, and bay. These same tree species are found along the stream courses with other woody and herbaceous growth. Undergrowth along the stream courses is well developed in most places. Game abundance and hunting pressure within the watershed are low. However, habitat quality could be improved through management.

Most species of game and non-game wildlife common to the Coastal Plain are present in the watershed. The most common of these are opossum, raccoon, cottontail rabbit, fox squirrel, gray squirrel, gray fox, bobcat, whitetail deer, muskrat, wood duck, bobwhite, mourning dove, common crow, and vulture. Numerous species of songbirds, small animals, amphibians and reptiles are indigenous to the area.

Wood duck and other common aquatic-type wildlife are present in the 112-acre area just north of highway 64. To a lesser extent, these species use the constructed farm ponds and intermittent streams.

Most ground feeding species of animals and birds feed on corn and soybeans after machine harvest. Various birds, squirrels, raccoon and opossums feed on immature ears of corn in late spring and summer. This food supply is readily available throughout the upland and lowland agricultural plant communities due to interspersion of the areas.

Hardwood and mixed pine plant communities provide habitat for fox squirrel, rabbit and other species. This type habitat is used by most species common to the adjoining agricultural plant communities.

Deer, raccoon, gray squirrel, opossum and other species inhabit the hardwood plant communities along the streams in the lower reach of the watershed. This habitat is also within a reasonable distance from the agricultural plant communities.

No endangered or threatened species of wildlife were identified by biologists who studied the watershed and prepared reports.

Watershed fishery resources are of low value. There are a number of impoundments on the main stem of Mill Branch which offer some fishing

opportunities. There are also a number of "woods ponds" that are utilized by sport fishermen to a limited degree. Fishing success is poor in the impounded areas. Stream fishing apparently is restricted to road crossings from State Highway 64 downstream. Above this point the main stem base flow is quite small and tends to go dry during summer months. Although stream fishing pressure is low to negligible, Mill Branch and Big Branch are used for spawning and recruitment of fish for the stream to which it is tributary.

From the vicinity of Highway 64 downstream to the end of the watershed, a seasonal stream fishery of approximately seven and one-half miles exists. Although the stream is privately owned, three county road crossings provide some public access.

Fish species in the watershed include largemouth bass, bluegill, warmouth, catfish, sucker, and many other species of lesser importance indigenous to the area.

Recreational Resources

The State Comprehensive Outdoor Recreation Plan (SCORP) completed for Georgia in 1971 included an inventory of recreation areas. Of the 18 recreation areas identified as existing in Bacon County, only one is located in the watershed. This one facility is a privately owned pond of 40 surface acres. It is open to the public for fishing on a fee basis. Of the 17 remaining areas outside the watershed seven are privately owned ponds and lakes. The remaining nine are neighborhood and roadside parks, education facilities, and similar non-water based facilities. Future recreation developments are planned for the general vicinity. Those being planned under programs administered by other than the Soil Conservation Service includes construction of the following: Lake Alma with a water surface area of 1,800 acres; Alma-Bacon County Community Recreation Area; Old Main Street (Linear Park); and eight neighborhood mini-parks. The plan provides for major financial assistance from the Model Cities Program of the Department of Housing and Urban Development and the Bureau of Outdoor Recreation.

Existing recreational resources are heavily utilized according to the State Comprehensive Outdoor Recreation Plan. Due to the relatively low income prevalent in the area, most residents spend their vacations at home and take advantage of local facilities. In the immediate vicinity, Hurricane Creek and Little Hurricane Creek provide some recreational opportunities; however, public access is limited. The Slash Pine Area in which the watershed is located includes the following major natural recreational opportunities within reasonable commuting distance: the Suwanee, St. Marys, Satilla, and Ocmulgee Rivers; the Okefenokee National Wildlife Refuge; and the Rocks. Several state parks are also available. The state has numerous boat launching ramps on the larger rivers, and excellent facilities are available at the state parks.

Archeological and Historical Values and Unique Scenic Areas

There are no places of known archeological, historical, or unique scenic value in the watershed. The National Register of Historic Places indicates that there are no places of historic value in Bacon County. An archeological study performed by The University of Georgia, Department of Anthropology, specifically for this project did not identify any sites.

Soil, Water, and Plant Management Status

Agricultural census reports indicate that land in farms in Bacon County decreased from 118,335 acres in 1964 to 109,357 acres in 1969.

In the past, field crops have contributed a great deal to the percentage of total agricultural sales in Bacon County. The value of field crops in 1949 comprised 68.2 percent of all farm products sold. In 1969 field crops accounted for only 31.5 percent of all farm products sold (Census of Agriculture). This significant reduction was accompanied by the virtual disappearance of such crops as cotton. In 1951 there was a record high of 4,350 acres of cotton in Bacon County. In 1972 only 10 acres were planted.

Tobacco, an important cash crop, has remained practically the same from 1949 to 1969. Within the same time period, corn acreage increased 40 percent. This can be attributed to the conversion of corn from a feed for work animals to a versatile cash crop.

Soybeans, a relatively new crop in Bacon County, were first planted in 1965. For some time the acreage doubled each year.

In 1964, 27 farms within the county reported sales of broilers. In 1969, 43 farms had reported sales of broilers comprising 38.6 percent of all agricultural products sold in Bacon County. This made poultry and poultry products the number one enterprise in terms of total sales.

Within the last five years, the number of cattle has declined.

The following tabulation shows a comparison of farm sales of some of the most important agricultural commodities in 1949 and 1969.[9/]

Value of Products Sold As Percentage of Total Sales

	1949 %	1969 %
Field Crops	68.2	31.5
Forestry Products	18.1	3.2
Poultry and Poultry Products	0.8	38.6

9/ "U.S. Bureau of the Census, Census of Agriculture, 1969," Volume 1. Area Reports, Part 28. GEORGIA, Section 2. County Data Appling Co., Jasper Co., Library of Congress Card No. 72-601370.

Value of Products Sold As Percentage of Total Sales (continued)

	1949 %	1969 %
Other Livestock and Livestock Products	12.3	25.1
Dairy Products	0.4	1.2
Vegetables	0.2	0.4

In this 20 year period there has been a significant reduction in the number of farms from 1,128 in 1949 to only 596 in 1969. The average size farm was 129 acres in 1949; and the average farm had 184 acres in 1969. The decline in the number of farms is a common trend in Georgia. The more efficient, larger farms tend to expand, and these progressive owners eventually buy out the smaller, less efficient farms. This accounts for the decrease in the number and average increase in the size of farms.

Yields from approximately 37 percent of the land used for production of agricultural and pine forest products are depressed due to the need for the control of excess water. A corresponding inefficiency in utilization of labor and capital results. Some landowners in Bacon County report a total loss of their tobacco crops in years with high rainfall during the critical growing season.

The Altamaha Soil and Water Conservation District in cooperation with the Soil Conservation Service is carrying out an active program of assistance to landowners in the following areas: conserving natural resources, conducting youth activities, assisting farmers with pollution abatement, and responding to the nation's call for more food production. Assistance has been provided to 100 landowners in development of soil and water conservation plans covering approximately 75 percent of the watershed. Approximately 65 percent of the planned conservation practices have been installed. Soil surveys of over 16,000 acres of the watershed have been completed.

The Georgia Forestry Commission in cooperation with the U.S. Forest Service through the various federal-state cooperative forestry programs, is providing forest management assistance, forest fire prevention and suppression assistance, distribution of planting stock, and forest pest control assistance to private landowners in the watershed area. These programs will be continued throughout the installation period of the project.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land Treatment

The most significant land treatment problem is the need for timely disposal of excess surface water from crop, pasture, and pine forest land. Saturated soil conditions create a very poor plant environment due to a lack of aeration. Mild winters and high rainfall and temperatures during the spring and summer create a problem in maintaining organic matter in some of the soils used for cultivated crops. There is a need for conservation practices such as wildlife habitat improvement, conservation cropping systems, crop residue use, minimum tillage, and water disposal systems on most cropland. At present, few landowners have adequate outlets for water disposal systems within the confines of their farms. The risk of crop damage or failure from flooding and wet conditions is too great to permit full utilization of several conservation and cultural practices available that would benefit the community financially. Loss of revenue and low income is also responsible for some practices not being installed. Excess water problems in parts of fields and in many instances entire fields cause inconvenience and prevent full utilization of land, labor, and capital.

Grassland problems consisting of low forage yields and low quality reflect a need for pasture and hayland planting, management, and water control. Excess water drowns plants or reduces palatability and quality and causes a loss in grazing time. The end result is very poor yields of beef per acre in problem areas.

Floodwater Damage and Drainage Problems

Damage from flooding and damage from poor drainage in the watershed are inseparable. Problems of excess water occur on 2,587 acres of corn, tobacco, soybeans, and pastureland, and on 2,828 acres of pine forest located on 153 farms. These farms are located primarily in the northwest, central, and southeast sections of the watershed. Values of crop and pastureland in the problem areas are approximately $200 per acre, and forest land is valued at $150 per acre. Due to inadequate storm sewers in Alma, four homes are subject to flood damage from a two year frequency flood. Most of the area subject to damage is in land capability Classes IIIw and Vw. Due to the nearly level topography and to the lack of outlets on individual farms in the problem areas, annual flooding occurs. Floodwater moves off slowly, and wet soil conditions prevail for extended periods. Planting dates are critical due to summer rainfall patterns, and delays often result in crop failure or depressed yields. Flooding and poor drainage reduce income and cause problems to landowners and operators in the following ways: (1) delaying planting; (2) sometimes damaging or destroying early planted crops to such an extent that replanting is necessary, resulting in added cost of additional land preparation, seed, and fertilizer; (3) depositing weed seed; (4) damaging crops and causing poor quality; (5) limiting grazing time and lowering forage

quality; (6) causing plant disease; and (7) delaying and, in extreme cases, preventing harvest. These are ever present hazards since the watershed is sufficiently near the coast to experience torrential rains when tropical storms approach. These storms usually occur during the fall harvest season. Few average size farms have outlets for needed field ditches and subsurface drains within the farm boundary. This problem is the most difficult to resolve and is of great concern to the Sponsoring Local Organization and landowners. No programs other than PL-566 exist in sufficient scope to solve this problem. The predominant soils are well adapted to crops grown in the area and respond well when these drainage practices are possible. The economic plight of the small farmer is so well known that it is needless to mention his need for fully utilizing all resources at his disposal.

Roads are inundated by floodwater for long periods of time causing added expense and inconvenience to people who live in the watershed. School busses and other traffic have to be rerouted for several days until floodwater recedes and roads can be repaired. Road damage consists of dislodgement of culverts, undermining of bridge abutments, erosion of road fills, and softening of road beds. Repairing these roads accounts for a large portion of tax money that could be used more advantageously elsewhere.

Each tributary or lateral was considered to be an evaluation reach (Project Map). An evaluation reach is a segment of a stream where the land uses, soil conditions, and yields are generally similar. Separate evaluation reaches were then combined into evaluation units as shown in Tables 4 and 6. These evaluation units are the basic units in which project costs and benefits are measured and compared. There are no significant differences in the problems associated with each reach.

Average annual damages by major categories are estimated as follows; crop and pasture, $64,675; road, $40,428; and pine forest, $22,384.

No loss of life has been attributed to floods in the watershed. High water and generally wet conditions are largely responsible for insect pests that affect the well being of residents. Flooded or saturated field roads, driveways, yards, and gardens are responsible for inconvenience and general disruption of daily routines.

Tobacco, the highest value (per acre) cash crop, is especially vulnerable to wet soil conditions, and occasionally the entire crop is lost. Excess water during the growing season also adversely affects quality and reduces yields of tobacco crops by about 60 percent. Production costs are increased because of the under-utilization of resources and because farm machinery becomes bogged down in wet places.

Approximately 23 percent of the forest land is either poorly stocked or unstocked with desirable tree species because of excessive water. On

portions of the near level coastal plains soils, extended periods of inundation and saturated soil conditions are serious problems to some forest landowners in the area. This condition results from both inadequate outlets to remove excessive water and from high ground water levels. Existing water courses in some areas are inadequate to remove excessive surface water and to reduce soil moisture in a period of time suitable for good growth and regeneration of timber stands or for ready access for management and protection.

Local efforts to improve conditions consist mainly of installing surface and subsurface drains in the relatively few instances where outlets are available within individual farm boundaries. The favorable results obtained by those fortunate enough to have adequate outlets for farm drains are well known in the watershed, and landowners have indicated project works of improvement will be used principally as outlets for subsurface drains. Minimum tillage farming is growing in popularity in this area and when used in combination with subsurface drains, satisfactory yields and minimum loss of soil results. The principal soils used for crop production in the problem areas perform well under this type of management.

Erosion and Sediment Damage

Erosion and sediment problems in the watershed involve two distinct elements, gross erosion and subsequent sediment yield. Gross erosion results from those physical processes that allow soil particles to move from one location to another. Sediment yield is the amount of these soil materials which are delivered to the watershed outlet and become a part of the downstream sediment load.

Gross sheet and rill erosion from all sources amount to approximately 28,000 tons annually or the equivalent of 1.3 tons per acre. In this watershed, cropland is the largest potential source of erosion, while other land uses, such as pasture, forest land, urban land and isolated critical areas comprise less significant sources. The 28,000 tons of gross erosion consists mostly of those soil particles that are washed from high points in a field, moved a short distance, and deposited in various locations such as lower portions of fields, field ditches, and overflow areas such as vegetated field borders, forest land or wetlands. Only a small amount, approximately 1,000 tons, or 0.05 ton per acre per year, is delivered to the watershed outlet to become sediment yield.

The low sediment yield is a result of several factors. Relief changes are small with most of the land sloping an average of 1 to 2 percent. The more rolling topography averages from 2 to 5 percent slope. The flat topography, low stream gradients and densely vegetated field borders and drainage courses restrict the quantity of sediment that enters the channels and outlets. Typical soil particles are sufficiently large to be quickly deposited when vegetation is encountered.

Erosion and sediment damages were found to be insignificant and were not evaluated. The lack of channels in the wide, flat drainageways is a natural geologic feature of the flatwoods resource area and not a result of recent sediment fill. No scour damage has been observed.

Irrigation

Due to the high rate of rainfall which is normally adequate or excessive during the growing season, few farmers are using supplemental irrigation. Water from several small ponds and pits is used for such high value crops as vegetables and tobacco. Soils are well adapted to sprinkler-type irrigation during periods of drought, but very few impoundment sites are available. The ground water resource is adequate if supplemental irrigation becomes a widely used practice in the watershed.

Municipal and Industrial Water

Alma has adequate supplies of underground water for the forseeable future. Hurricane Creek and Little Hurricane Creek are also nearby if additional supplies are ever needed. However, these streams would not be reliable in dry periods.

Recreation

No suitable impoundment or stream oriented sites for water based recreation exist in the watershed. The proposed Lake Alma, and associated recreational developments should fulfill the need for this type recreation. The existing ponds provide some fishing opportunities. However, they are privately owned and some are not open to the public. Others can be fished on a fee basis.

Fish and Wildlife

The poor quality of fish and wildlife values in the watershed was described under the Fish and Wildlife Resources section. To improve the game habitat the following practices are needed: food and cover plantings, prescribed burning of woodlands, and the establishment of several species of oaks such as water oak, laurel oak, and sawtooth oak.

Few pond sites exist in the watershed; therefore, opportunities for improving the fisheries resource consist mainly of improving management of the few existing ponds. The stream fishery is limited by the lack of depth and the intermittent nature of flow. This low value fishery with limited public access is located downstream from Highway 64 (Project Map). Although fishing pressure is low to negligible, the stream is used for spawning and recruitment of fish for the stream to which it is tributary.

Economic and Social

According to the 1969 Census of Agriculture, for Bacon County, 6 percent of the commercial farms had gross sales of less than $2,500, 19 percent less than $5,000, and 21 percent less than $9,000. When production costs and family labor are considered, net profits are extremely low. These county statistics are representative of the situation within the watershed.

The watershed is located in an economically depressed area which is eligible for federal programs of assistance designed to help such areas. The Alma-Bacon County Model Cities Program is designed to improve the living standards of inhabitants of the area. The entire watershed is located in this Model Cities Program area. There is a need for additional agricultural enterprises and/or more off-farm employment opportunities to supplement low incomes of most family farms. Approximately 20 percent of the water problem area is located on farms using one and one-half man-years or more of hired labor.

The recent depletion of food reserves in the nation supports the need for promoting rural community development in this and other similarly depressed areas. The need for reduction of floodwater and poor drainage damages to roads, crops, pasture, pine forest, and gardens is obvious. Increased production of needed crops and economic stimulation from additional jobs, sales, and purchases are also needed. The Cooperative Extension Service recognizes the need for rural development in Bacon County and is actively cooperating with the Model Cities officials in promoting additional activities designed to improve living standards and to make farming more attractive and profitable. The low per capita income (shown under Watershed Resources - Environmental Setting) demonstrates further the need for improvement of the local economy.

Other

Since watershed streams are intermittent or ephemeral, wells and ponds are relied upon for livestock and general farm use during periods of low rainfall.

PROJECTS OF OTHER AGENCIES

There are no existing or soon to be constructed water resource development projects proposed by other agencies in the watershed.

PROJECT FORMULATION

The Mill Branch Watershed Association was organized, and officials were elected in September 1954. This action occurred during a public meeting in the Bacon County Courthouse. An application for assistance under provisions of PL-566, the Watershed Protection and Flood Prevention Act, was approved in October 1954. A field examination and report to the State Soil and Water Conservation Committee was completed in November 1954. Preliminary surveys and investigations revealed the possibility of a feasible project, and planning authorization was approved by the Administrator of the Soil Conservation Service in January 1957. Public meetings, news articles, and individual contacts by planning personnel kept the public informed of progress during the planning process. The tentative plan that was developed involved a considerable local share of construction cost for irrigation structures. The project sponsors and landowners decided they would be unable to bear this cost, and planning was terminated at their request in December 1960.

In 1969 the sponsors requested that planning of the watershed be resumed. Prior to the resumption of planning, a field reconnaissance was made by biologists representing the United States Fish and Wildlife Service, Game and Fish Division of Georgia Department of Natural Resources, and the Soil Conservation Service. Upon completion of the study, these biologists presented their findings at a public meeting in the Bacon County Courthouse on February 17, 1970. The Administrator of the Soil Conservation Service reauthorized planning on December 31, 1970. During the second planning effort, three public meetings and numerous conferences with watershed association officials were held. Planning inputs were supplied by other agencies and landowners in the watershed. The work plan proposal was presented to local agency representatives prior to its being presented to the general public. Representatives of the following agencies and organizations participated: Agricultural Stabilization and Conservation Service; Farmers Home Administration; Soil Conservation Service; Georgia Forestry Commission; Game and Fish Division; Model Cities Program; Rural Development Center, Tifton, Georgia; and Abraham Baldwin Agricultural College. All public meetings were well attended, and support of the project was unanimous.

Preliminary draft work plans and environmental impact statements were mailed to federal and state agencies on April 26, 1972. Comments received were helpful in preparing subsequent drafts.

A public information meeting and informal field review was held on February 18, 1975. All concerned federal and state agencies and interested citizens were furnished with advance copies of the Draft Plan and EIS and were invited to attend and participate in this meeting. No objection to the project was raised at the meetings.

On February 21, 1975 the draft plan and environmental impact statement were mailed to federal and state agencies and concerned citizens for their review and comment. Comments were received from concerned agencies by the end of May 1975.

With another PL 566 project in the review process at the same time, state agencies and the Soil Conservation Service mutually agreed that the review of Mill Branch be delayed. This request was granted with the agreement that the review would be re-initiated at some date agreeable with the state agencies and SCS.

Representatives of the Soil Conservation Service and concerned state agencies met on October 14, 1975 and February 12, 1976 to informally review the project.

Those environmental concerns that were identified at these meetings were addressed by the SCS as a part of the formal review process that was reinstated by state agencies on February 24, 1976. These concerns were formalized as review comments that were received at the end of the 30-day review period on March 24, 1976. Contacts were made on two other occasions to discuss responses to these formal comments.

During project formulation, consideration was given to the Plan for Development of the Land and Water Resources of the Satilla-St. Marys Basins. This plan was prepared by the United States Study Commission and published in 1963. Objectives included in the Basin Plan that are proposed for this watershed include flood prevention, agricultural and forest water management, soil conservation, and forest conservation and utilization.

The overall objectives of the project are to improve the economic and environmental conditions of the watershed through water and related land resource conservation and development. More specific objectives are as follows:

1. To provide watershed protection needed to reduce erosion and bring soil losses within tolerable limits.

2. To improve the management of cropland, pasture, and forest land areas.

3. To reduce damages caused by floodwater and saturated soil conditions.

4. To minimize the irreversible and irretrievable commitment of natural, unrenewable resources in the pursuit of the objectives above.

Pasture, cropland, and wildlife habitat treatment goals were developed by professional agricultural workers and biologists, and these goals were correlated with Soil and Water Conservation District goals for achieving adequate treatment as shown in the section entitled WORKS OF IMPROVEMENT TO BE INSTALLED. Conservation land treatment objectives can be accomplished by acceleration of existing programs. No major change in agricultural land use is expected or desired by the sponsors.

Intensification of present uses, made possible by damage reduction and better soil conditions, will enable accomplishment of project objectives.

The land treatment program for forest land was developed from a field survey of the watershed. The proposed program is based on treatment needs greater than the existing programs can supply. The land treatment needs are adjusted for expected landowner participation and length of the installation period of the project. The water control program for forest land is designed to remove runoff from a storm with an average recurrence frequency of every two years and a duration of 24 hours. The system is designed so that this removal will be complete 5 days after the storm ceases. Research by the U.S. Forest Service has shown that this level of water management, which is designed to reduce the seasonal water table to twenty-four inches below the soil surface, will give the desired benefit to increased growth of pines. Removing floodwaters from the ground surface within a five day period is also sufficient to protect young pine trees from mortality.

Another factor taken into consideration during the formulation of the forest land treatment program was the increased level of management made possible by easier access to the forest stands. Landowners and operators have the opportunity to better schedule various cultural practices needed to realize maximum benefits of the water control program and provide increased protection to their forest lands.

Land use changes are expected to be limited primarily to road construction, residential and industrial development, airport expansion, and fruit and berry crop cultivation. These are trends and are not expected to be influenced by the project. Soil types and land capabilities of a major portion of land now in forest land in the problem areas are not suitable for agronomic crops.

The following levels of protection have been agreed to by the Sponsoring Local Organization and the Soil Conservation Service.

Land Use	Frequency	Storm Duration	Period of Runoff Removal
Truck and specialty crops and rural yards, gardens, and related areas	5-year	24-hour	one day
Other cropland	2-year	24-hour	one day
Pasture	2-year	24-hour	two days
Forest (Pine)	2-year	24-hour	five days

Economic feasibility, needs, and objectives were factors involved in determining size and location of improvements. There are no suitable

floodwater retarding structure sites in the watershed. Few well-defined stream channels exist in the problem areas; consequently, all project objectives cannot be met by improvement of existing channels. Bacon County officials have constructed several short reaches of open channels at road crossings in an attempt to protect bridges, culverts, and road fills.

Environmental Considerations

Effects of possible flood stage increases downstream from project works of improvement were considered. Three farm ponds are located in series on the main stem of Mill Branch below the major portion of proposed construction. Above each of the two uppermost ponds are flat wooded areas approximately one-half to three-fourths mile long. These wooded areas serve as effective sediment traps and possible oxidizers of pollutants. Below the downstream pond, the hardwood forest extends for a distance of approximately six miles to the end of the watershed. Flood stage increases induced by the project will be retained within these forested boundaries.

The provision of outlets for 5 day removal of runoff from a 2-year, 24-hour duration storm from approximately 2,828 acres of predominantly pine forest land will result in growth of a wider variety of wildlife food plants while reducing the seasonal wet soil condition.

Alternatives

The following alternatives were considered:

1. Accelerated conservation land treatment. This alternative consists of those practices and measures described previously under the heading of "Planned Project - Land Treatment" with the following exception: Conservation Land Treatment will be limited to management of cropland, pasture, and forest with minor excess water problems. Practices for control of excess water will be reduced to those having existing suitable outlets. Impacts from this alternative would be similar to those described for the land treatment portion of the proposed plan. Flood damages would be reduced approximately one percent. Water quality in the intermittent and ephemeral watercourses would be improved. Adverse impacts resulting from the irreversible and irretrievable commitment of land to structural measures would be eliminated. Cost of this alternative is estimated to be $341,500.

2. Accelerated conservation land treatment with excavation on laterals and pumped outlets into leveed mains. Conservation land treatment practices would be applied as referred to in alternative 1. A major portion of the flood plain of Mill Branch, Little Bear Branch, Rigdon Branch and main tributaries would be diked and 27 pumping stations installed. The dikes would replace 115 acres of agricultural and forest land and 78 acres would be required for approximately 535,000 cubic yards of borrow material. The borrow area would be

replanted in trees, and dikes would be planted in grasses and legumes. Flood stages within the diked areas would increase compared to no project condition but duration of flooding would be expected to decrease. Levels of protection in areas served by laterals would be similar to that shown in the selected plan. Approximately 0.6 miles of natural channel on the outlet section of Mill Branch would probably remain unchanged. Wildlife habitat within the diked areas would remain virtually unchanged. Large quantities of fuel would be required to operate pumps on the larger drainage areas. Electrical energy would be practical for use in operating pumps on small drainage areas. Migration of fish into tributary flood plains during flood periods would be restricted. Turbidity of water in the main drainageways would increase during and immediately after pumping. The estimated installation cost of this alternative is $2,563,000.

3. Accelerated conservation land treatment, flood proofing of fixed flood plain improvements, and public acquisition of water problem areas for uses more tolerant to excess water conditions. Conservation land treatment would be applied in accordance with alternative 1. Public road fills would be raised at approximately 60 locations. Public acquisition of approximately 5,415 acres of agricultural and pine forest land located on about 153 farms would be accomplished. Production of agricultural commodities would be curtailed and production of pine forest products would remain at present levels if the area was managed. Production would decrease if public ownership preempted harvesting and management. Forest land wildlife habitat would remain in its present condition. Water quality would probably improve. The estimated cost of installing this alternative is $4,318,300.

4. No project. The conservation land treatment program would continue at the present level provided funding of the Soil and Water Conservation District program and Rural Environmental Conservation Program continues. Assistance from other agricultural, forestry, and fish and wildlife agencies would also remain unchanged. Most landowners with the financial ability and with outlets on their land have installed some flood prevention and drainage channels. It is expected that relatively few additional measures can be installed without some type of cooperative project-type activity. Fish and wildlife habitat would likely remain unchanged. Also, little improvement of the human environment could be expected. Water quality in the intermittent streams in and immediately below the project would probably remain unchanged. Production of food and fiber and farm income would probably remain at or below current levels. Additional landowners may abandon farming as a result of excess water problems described in the sections entitled ENVIRONMENTAL SETTING AND WATER AND RELATED LAND RESOURCE PROBLEMS. The net annual monetary benefits that would be foregone by not implementing the project would be approximately $137,100.

WORKS OF IMPROVEMENT TO BE INSTALLED

Conservation Land Treatment Measures

Practices needed to achieve objectives for the protection and development of watershed land resources will be planned and applied in accordance with cooperative agreements between landowners and operators, the Altamaha Soil and Water Conservation District, and the Georgia Forestry Commission. Among the most important features of this program will be the treatment of about 4,850 acres of cropland, 150 acres grassland, 4,800 acres forest land, 80 acres of miscellaneous land, and 10 acres of critically eroding land. Goals are to improve some areas for wildlife by including in conservation plans provisions for food and cover plantings of field borders, corners, odd areas, and openings in forest land. Treatment of cropland will consist of combinations of the following practices:

1. Installation of conservation cropping systems: The practice of growing crops in combination with needed cultural and management measures. Cropping systems include the use of rotations that contain grasses and legumes, as well as rotations in which the desired benefits are achieved without the use of such crops. Alternative cropping systems that will hold soil loss to tolerance limits as recorded in the publication entitled "Soil Loss Prediction for Georgia" will be stressed. Soil loss tolerances for Tifton and Norfolk soils are 4 tons per acre and for Lakeland 5 tons per acre annually. These are the three principal "upland" soils with erosion hazards in the watershed. A wide range of alternative cropping systems capable of holding soil loss at or below allowable or tolerable limits are available to landowners.

2. Installation of minimum tillage: The practice of limiting the number of cultural operations to those that are properly timed and essential to produce a crop and prevent soil damage. This practice retards or prevents deterioration of soil structure; reduces soil compaction and formation of tillage or "hardpan"; and improves soil aeration, permeability, and tilth.

3. Installation of crop residue use: The practice of using plant residues, in lieu of burning or other means of disposal, so as to protect fields during critical erosion periods. This practice conserves moisture, increases infiltration of rainfall, reduces soil losses, and improves soil tilth.

4. Installation of land smoothing: The practice of removing irregularities on the land surface by use of special equipment. The purpose is to allow a better distribution of water and to facilitate installation of irrigation, drainage, and parallel terrace systems.

5. Installation of water disposal systems, consisting of terraces, grassed waterways, subsurface drains, and shallow field drainage laterals. These will be applied singly or in combinations as dictated by the needs of individual fields.

Grassland treatment will consist of pasture and hayland planting and management. Management will consist of proper treatment and use designed to provide soil protection, to reduce water runoff, to maintain or improve quality and quantity of forage, and to prolong the life of desirable forage species. Wet soils used for pasture will have water disposal practices applied. These will consist of shallow lateral drainage ditches and subsurface drains.

Severely eroded areas (critical areas) will be stabilized by grading, shaping, liming, fertilizing, planting, and mulching. Grasses and legumes will be planted, and where the sites are suitable, species of oak trees suitable for wildlife food production will be added. Treatment of miscellaneous land will consist primarily of proper management and protection from erosion.

Better management of approximately 23 existing ponds to make them more attractive and to provide better habitat for game fish, waterfowl, and shore birds will be emphasized. New farm ponds to be constructed will consist of dam construction on intermittent or ephemeral watercourses. These ponds will provide manageable waters for fish production; water for irrigation; water for livestock; water to facilitate better grazing distribution; water for wildlife; and sources of escape fish to populate watercourses.

To facilitate the conservation land treatment program, technical assistance will be provided to accomplish soil surveys of the remaining 5,000 acres of the watershed not mapped.

The forest land treatment program was developed from a study of land treatment needs prepared by the U.S. Forest Service in cooperation with the Georgia Forestry Commission after field surveys of the watershed made by the U.S. Forest Service and from land use recommendations made by the Soil Conservation Service. In order to realize the maximum benefit from the forest land, the land must be placed under proper management. This will include the preparation of 130 forest management plans, the planting of 1,860 acres of trees in understocked areas, and the improvement of 2,940 acres by other cultural practices such as thinnings and improvement cuttings. Tree plantings will include several species of oaks suitable for wildlife food production. These management practices also include the installation of lateral drainages in excessively wet areas.

Interplanting will be for the purpose of reinforcing existing young stands; improving the ultimate quality of the forest crop; improving

species composition in hardwoods; reducing soil losses; and improving watershed hydrologic conditions.

Thinning and improvement cuttings consist of the removal of merchantable trees from an immature stand. The purposes to be served include maintenance of a well-spaced stand of desirable trees; provision of periodic income from sales of forest products; increase in growth of remaining trees; improvement of wildlife habitat; increase of forage production; provision for continued soil protection; and enhancement of the natural beauty of the area. Management practices also include the installation of lateral drainages in excessively wet pine forest areas.

In addition to these accelerated treatment measures, the existing cooperative Forest Management and Cooperative Forest Fire Control programs will be available to provide assistance to private landowners and operators.

Structural Measures

Planned structural measures consist of approximately 229,500 feet of multiple purpose open channels for flood prevention and agricultural and forest water management (Figure 1). These measures are located and designed to serve groups of landowners. Floodwater and drainage outlets for agricultural and pine forest land will be provided for all farms having such a need.

Present conditions along the path of proposed channel work are similar. Soils to be excavated are mostly Pelham and Rains with some scattered areas of Plummer. These soils are poorly drained and nearly level (slopes range from 0-3 percent), and they occur along drainage-ways and in depressions. They are well suited for production of forest products when water control measures are installed. Profiles vary, but generally the surface is a light gray to dark gray loamy fine sand. Generally subsoils are gray sandy clay mottled with yellowish brown to brown. Vegetation consists principally of mixed pine and hardwoods with an understory of water tolerant shrubs including gallberry, wax myrtle, and palmetto. Excavation through these soil types is necessary to provide protection to adjacent areas of better soils used for agricultural crops, pasture, and forest products.

Table 3B lists classification of drainageways. With the exception of 0.3 miles of natural channels and 2.5 miles of man-made ditches, the channel work will be done where no well defined channels exist. Flow conditions are ephemeral on 31.3 miles proposed and intermittent on the remaining 9.3 miles.

Basis for selection of flow capacity used in open channel design is to provide desired levels of protection for various crops and land uses (INVESTIGATION AND ANALYSES). Runoff removal time for each land use for

a selected storm is shown in PROJECT FORMULATION section. Channels protecting cropland will be of sufficient depth for use as subsurface drain outlets. These measures will provide flood prevention and drainage benefits to pine timber, corn, soybeans, vegetables, fruit crops, pasture, and hay.

Channels will be excavated to 1/2:1 side slopes except in short sections where flatter slopes are needed for aesthetic purposes. Most sections will retain cross-sections as excavated while some will undergo a natural re-sectioning to a parabolic cross-section immediately following excavation. Constructed channels will provide adequate depth and capacity. Ditch banks and excavated material will be vegetated at the time of channel construction. If the season in which construction is accomplished is not compatible with establishment of perennial vegetation, temporary planting (annuals) or mulching will be utilized until conditions are right for planting perennials.

The low sediment delivery rate will permit deferred maintenance or re-sectioning at 25 to 50 year intervals. Access roads will not be needed for this maintenance procedure. Plantings to enhance aesthetic values at needed locations will be a part of project installation.

Results of an analysis made to determine effects of the project downstream revealed the following changes in water surface elevations on Big Branch at the watershed outlet.

Frequency of Occurrence	Change in Water Surface Elevation
1 - year	+ 0.3 foot
2 - year	+ 0.3 foot
5 - year	+ 0.3 foot
10 - year	+ 0.2 foot
50 - year	+ 0.2 foot

An analysis was also made to calculate increases in water surface elevations in the emergency spillways of three farm ponds constructed in series on the main stem of Mill Branch below proposed channel work. These ponds, with principal spillways of metal pipe, were constructed to SCS specifications in 1954 and are near the end of their design life. Flood routing of storms ranging from a 10-year, 24-hour to 100-year, 6-hour duration indicate a maximum increase of 0.6 foot for the downstream dam and 0.5 foot for each of the two located above. The SCS Engineering Memorandum - 27, class "a" freeboard hydrograph after project, shows an increase of 0.7 foot for the lower dam, and 0.3 foot for each of the two above. Bacon County will secure flowage easements for this increased flow generated by installation of project structural measures and will assume responsibility for repair of the emergency spillways of the ponds should damage occur.

Temporary environmental protection weirs will be installed at approximately 9 locations on Rigdon Branch, laterals 3B, 20R, 13M, 31M, 33M, and 35M (Table 3A). These planned structures consist of rock rip-rap construction with drop ranges from 1.0 to 2.0 feet (Figure 3). One structure at station 466+00 on Rigdon Branch will utilize a 36 inch diameter asphalt-coated, corrugated metal pipe equipped with a flashboard riser. The principal function of these loose rock weirs will be to reduce grade and velocities until vegetation has become established and the aged condition reached.

Land rights for project channels consist of easements on approximately 255 acres of forest land and 41 acres of agricultural land and alteration of bridges, culverts, and underground utilities at approximately 61 locations.

No person, business, or farm operation will be displaced as a result of project installation.

Land use changes expected to result from the planned project are as follows: forest land changed to open channels - 44 acres, and cropland changed to open channels - 7 acres.

To minimize permanent damage to the relatively low value forest wildlife habitat to be cleared for rights-of-way, construction will be from one side, leaving the tree canopy undisturbed on the opposite side. Oaks or other mast producing trees, and den trees of value to wildlife will be left when possible. Spoil and channel banks will be vegetated immediately after excavation and plantings of oaks and other trees and shrubs for wildlife food and cover will follow (Figure 1).

In order to reduce the potential sediment damage to downstream reaches as a result of channel construction, the following measures will be incorporated into channel design and construction.

1. A vegetated buffer zone of at least 500 feet will be maintained between channel work and the upstream ends of the ponds. For main Mill Branch channel this buffer strip will be approximately 2,500 feet.

2. Sediment traps will be designed to accommodate estimated channel erosion during construction. The traps will consist of excavating storage reservoirs within the channel at locations where sediment deposition is anticipated. Sediment traps will be monitored and appropriate action taken during the project installation period to insure that they function as desired.

3. As channel work is installed, berm and spoil areas will be vegetated with temporary vegetation. This will be followed within 6 to 12 months with permanent grasses, wildlife plantings, and mast producing trees. Native vegetation, which is prolific in this area, also plays a beneficial part in vegetative stabilization.

Excavated material will be placed in a manner so as to minimize the required clearing and disturbed areas. No construction is planned along perennial streams or through high value wildlife habitat. Breaks will be left in spoil banks as needed for side drainage to prevent water from being trapped behind spoil thereby creating mosquito breeding areas. Pipe drop inlets will be installed at all side drains where erosion could be a problem (Figure 2).

Construction will be in accordance with SCS Engineering Memorandum-66 in order to minimize soil erosion and water and air pollution. This memorandum and other guidelines establish a Service policy for complying with provisions of the Water Pollution Control Act (PL 84-600, as amended). Debris from clearing the right-of-way will be buried under spoil or placed to one side of the right-of-way. Prior to beginning project operations, plans for solid waste disposal will be submitted to the Solid Waste Management Service, Environmental Protection Division, Georgia Department of Natural Resources for approval.

An archeological survey of planned excavation areas has been performed under contract with the University of Georgia, Department of Anthropology. Based on this study, the proposed watershed project is not considered to pose a threat to any archeological resources. The National Park Service, State Archaeologist, State Department of Natural Resources and other state and federal agencies will be notified immediately after the project is authorized. Appropriate officials will also again be notified well in advance of construction of the various construction units. Supervisory personnel and contractors will be continuously alert for any evidence of artifacts or other objects of archeological, historical, or mineral importance at construction sites. If any are found, the appropriate federal and state officials will be promptly notified. The provisions of Public Laws 86-523, 89-665, and 93-291 will be carefully adhered to during project installation.

EXPLANATION OF INSTALLATION COSTS

Conservation Land Treatment

Estimated cost of non-forest conservation land treatment is $288,500. PL-566 funds are for technical assistance necessary to accelerate conservation land treatment for watershed protection and for critical area stabilization cost sharing. Included in this amount is $500 for soil surveys and $30,600 for direct technical assistance to landowners and operators planning and applying the needed measures. Other funds in the amount of $15,400 will be provided by the Soil Conservation Service under the going PL-46 programs. PL-566 funds in the amount of $2,100 for materials will be utilized in critical area planting. The estimated cost to landowners in equipment use and labor is $900. The remaining $237,800 is the cost to the Sponsoring Local Organization and landowners and operators planning and applying the needed conservation land treatment and fish and wildlife enhancement measures.

The total cost of installing the forest land treatment program is estimated to be $139,300. Technical assistance to private landowners for the installation of forestry measures will cost approximately $23,100 of which $16,200 will be from PL-566 funds, $3,200 will be from Georgia Forestry Commission funds, and $3,700 will be from the existing Cooperative Forest Management Program. The existing Cooperative Forest Fire Control Program will contribute services to private landowners valued at $19,400. The small landowners will provide $17,400 for their part of the installation program, and the industrial companies will provide $17,400.

The estimated total installation cost of the conservation land treatment program is $427,800, with $49,400 from PL-566 and $378,400 from other sources (Table 1).

Structural Measures

Total structural measures costs are approximately $972,800 with PL 566 costs amounting to $730,300 and local costs amounting to $242,500 (Table 2). Construction costs for multiple purpose channels are estimated to be $701,600. Fifty percent of these costs were allocated to flood prevention and fifty percent were allocated to agricultural water management. Engineering costs of approximately $105,900 will be PL 566 costs. Land rights of $60,100 will be local costs. Project Administration cost are estimated to be $105,200 with $98,200 PL 566 costs and $7,000 local costs.

Joint flood prevention and drainage problems exist in drainage areas of planned open channel construction. PL-566 costs include all construction allocated to flood prevention and not more than 50 percent of construction costs allocated to agricultural water management. PL-566 costs also include engineering services and project administration costs

incurred by the Service. Engineering services include the direct cost of engineers and others for surveys, costs of investigations, and costs of design and preparation of plans and specifications, including associated vegetative work. PL-566 project administration costs include expenses of reviewing engineering plans, expenses of government representatives, expenses of construction surveys and inspection service during construction to insure construction is carried out according to plans and specifications (Tables 1 and 2).

Other costs include the Sponsoring Local Organization's share of construction allocated to agricultural water management, value of all land rights, legal fees, and construction inspection and administrative costs incurred by the Sponsoring Local Organization. Land rights consist of securing proper easements and rights-of-way to approximately 296 acres at an estimated cost of $29,300; the alteration of bridges, culverts, and underground utilities at 61 locations at an estimated cost of about $30,800. Total land rights costs are estimated to be $60,100 (Table 2).

Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocation becomes necessary, cost sharing percentages will be based upon the ratio of PL 566 funds and other funds, minus relocation payments, to the total project cost.

A schedule of obligations of funds by fiscal years during the installation period is as follows:

	PL-566		Other		
Year	Land Treat.	Str. Meas.	Land Treat.	Str. Meas.	Total
First	$ 9,880	$ 2,000	$ 75,680	$ 0	$ 87,560
Second	9,880	182,075	75,680	60,625	328,260
Third	9,880	182,075	75,680	60,625	328,260
Fourth	9,880	182,075	75,680	60,625	328,260
Fifth	9,880	182,075	75,680	60,625	328,260
Total	$49,400	$730,300	$378,400	$242,500	$1,400,600

EFFECTS OF WORKS OF IMPROVEMENT

Flood Prevention, Agricultural and Forestry Water Management, Erosion and Sediment Control

The planned conservation land treatment program will reduce gross erosion from approximately 28,000 tons annually to 17,000 tons annually, a reduction of 11,000 tons. Sediment yield will be reduced from 1000 tons (0.05 ton per acre) to 900 tons (0.04 ton per acre) annually. This 100-ton annual reduction is less than one percent of the total annual sediment for the Satilla River Basin. The present annual average of 38 mg/l of suspended sediment in waters flowing from the watershed will be reduced to 34 mg/l.

Productive capacity of the soil will also be improved, and the protected soil resource will continue to provide food and fiber for future generations. The general appearance of the landscape will be enhanced.

The 23 existing and 2 proposed farm ponds will provide needed water for farm use and outdoor recreation. A habitat for fish, aquatic wildlife, and shorebirds will be created. Upland game habitat will be enhanced by 150 acres of food and cover plantings. Song birds and other non-game wildlife will also have access to these areas.

Improved land use will allow more efficient use of farm resources and this will result in more economical and profitable farm operations. The accelerated emphasis on assisting landowners and operators to plan and apply proper conservation measures on approximately 170 farms will result in increased income and more effective use of land, labor, equipment, and other capital assets.

Planned levels of protection (PROJECT FORMULATION) will allow removal of excess surface water in sufficient time to prevent damage to approximately 2,828 acres of pine forest and 2,587 acres of agricultural land located on 153 family-type farm units. Approximately 505 watershed residents will be directly benefited by the structural measures from an agricultural and forestry production standpoint. Most of the approximate 2,750 residents are expected to benefit from a reduction of floodwater-type mosquito breeding areas. Residents of the county will benefit from reduced road maintenance costs.

Landowners and the Sponsoring Local Organizations do not anticipate nor do they desire land use changes as a result of the project other than that land which will be utilized in construction rights-of-way. No benefits were calculated for bringing new land into production.

Reduction of the excess water hazard will allow greater freedom in selecting conservation rotations. Better management practices will be possible resulting in higher yields of improved quality products.

Structural measures will replace approximately 44 acres of forest land and 7 acres of cropland valued at approximately $150 and $200 per acre

respectively. In addition to the loss of production of forest products and agricultural commodities from these areas, forest land habitat for wildlife will be reduced by 44 acres. This habitat will be replaced by an intermittently flowing stream providing, at first, a low value habitat for water oriented creatures. As the channel continues to age and accumulate more vegetation, this habitat will improve. Generally low quality forest land wildlife habitat will be degraded by the clearing of approximately 211 acres for construction rights-of-way. Distrubed areas will be vegetated immediately after construction, and oaks and other species of trees useful for wildlife food will be planted. This treatment will eventually restore and even improve habitat for some wildlife including deer, squirrel, rabbit, fox, raccoon, opossum, quail, reptiles, and songbirds. Habitat for life forms adapted to saturated soil conditions will be degraded due to creation of a less wet condition.

Drainage outlets for an airport and industrial park will be improved by agricultural and forestry channels traversing the area. Project channels will provide better outlets for existing road culverts within the watershed thereby reducing maintenance costs at stream crossings. Some 42 locations will directly benefit with approximately $28,300 in benefits being derived from reduced maintenance.

Growth, access, and regeneration on 2,828 acres of forest land will be directly improved. Many of these acres are not presently producing economic returns. More effective management and protection of these areas will be possible. Installation of this program will generate further income in the form of increased man-hours needed to harvest and process the increased amounts of forest products. Habitat for some species of wildlife will be improved by the change to a more diverse and palatable ground vegetation.

The proposed forest land treatment measures will significantly improve the condition and productivity of the forest lands. Good water management and forest management with continued protection from fire, insects, and disease will combine to increase natural regeneration and tree growth and will increase the accessibility of the forest land for management.

The water control level recommended for the forest land is such that the impact upon water yield characteristics would be small. The project may cause reduced peak flows if it has increased the available soil storage at the time of precipitation. If the water table is at the surface, the areas may yield surface runoff more rapidly.

Where water control is needed, the system will be designed to facilitate the removal of excess surface water only. The greatest impact on the ground water table will come about through transpiration of the improved stand of trees. The low level of water control needed on the forest land to accomplish the benefits pointed out in this plan will have a minimal impact on the quite limited fishing and waterfowl resources.

Small game is usually benefited by programs of this nature. Removal of surface waters in the forest results in a change in the low-growing types of vegetation. Native plants expected to become established on these formerly saturated forest soils include seed, fruit, and browse producers which are attractive to small and large game species and many non-game species. Feed for small game and non-game wildlife is expected to increase with this addition of a food supply to the natural forest cover. The development of more productive forests will provide greater quantities and better quality fiber for industry, recreation opportunities, aesthetic pleasure, forage use, and forest animal habitat. The hydrologic condition of the forest soils will be improved.

Removing excess surface water from the forest land could increase the hazard of wildfires. However, prescribed burning of pine forests for hazard reduction at intervals of from three to five years is a standard forest management practice in the area. A shift to a less wet condition on the improved forest area will allow more effective prescribed burning at intervals which will reduce the probability, size, and intensity of wild fires. Prescribed burning is also desirable for reducing air pollution associated with wild fires and improving vector control and game habitat.

Although some industry has recently located in Alma and more is expected as a result of efforts by the Model Cities Program, the local economy is largely based on agricultural production and processing. The Model Cities Program administrators in cooperation with the Cooperative Extension Service and others are introducing new agricultural enterprises that will be enhanced by removal of the flood hazard.

A considerable volume of corn, the most important crop grown in the watershed, is used in producing hogs, cattle, and poultry; some of the corn is being fed as silage. The increased production of corn resulting from the project is expected to be utilized locally. Georgia produces only a small fraction of corn and other feed grains needed by farmers in the state.

The project is compatible with the Plan for Development of the Land and Water Resources of the Satilla-St. Marys Basins developed by the United States Study Commission. The project will contribute to the achievement of objectives contained in the Basin Plan in the fields of flood prevention, drainage, soil conservation and utilization, forest conservation and utilization, public health, and sediment control.

A hydrologic analysis of downstream effects of the project reveal that the Mill Branch and Big Branch forested flood plain at the project outlet is more than adequate in cross section to contain increased flood stages.

Increases in the stream water surface elevations vary according to intensities of storms as shown in the WORKS OF IMPROVEMENT TO BE

INSTALLED section. The maximum increase was calculated to be 0.3 foot for a five year frequency event.

By installing channels, where none existed previously, it can be expected that some erosion with increased water turbidity will occur during and immediately after channel construction. However, it is anticipated that this eroded material will be accommodated in sediment traps to be installed along channel reaches. Wide, flat, thickly vegetated areas in the lower reaches of the project will also act to filter sediment and to oxidize any other pollutants that may reach the area. An aging process of 6 to 12 months will be required for the establishment of vegetative cover during which time disturbed areas will be stabilized. Native vegetaion such as annual weeds will also contribute to the stability of distrubed areas.

The 40 acre recreational pond identified as the only facility in the watershed is located one mile downstream from channel work. The sediment trap and the undisturbed area between the planned work and the recreational pond will minimize any construction induced turbidity. Other existing and proposed recreational areas are located away from channel work and will not be affected. The proposed Lake Alma, which is outside the watershed area, will not be affected.

Water quality data published by the Department of the Interior, Geological Survey for the Satilla River 3 miles north of Waycross indicated fecal coliform contents ranging from 30 to 2,300 MPN; biochemical oxygen demand from 0.9 to 1.6 mg/1; turbidity 4 to 5 JTU; pH 4.7 to 6.1; dissolved oxygen 5.3 to 10.1 mg/1; temperature 10 to 25 degrees C; phosphate 0 to 0.24 mg/1; nitrite plus nitrate 0 to less than 0.02 mg/1. Testing was carried on from October 1970 to September 1971. The drainage area at the gage section is approximately 1,200 square miles of land quite similar to the Mill Branch Watershed area. Farm drainage systems have been installed on much of this 1,200 square mile area.

The Mill Branch drainage area (33 square miles) is considered typical of the many contributing drainage areas of the Satilla River above the gage station. The gage is about 25 miles downstream from the project. The Department of Housing and Urban Development arranged for a water quality analysis to be made by the University of Georgia at several locations on Hurricane Creek much nearer the watershed. At U.S. Highway No. 1, about one mile from the Mill Branch watershed boundary, water quality on December 10, 1972 was as follows: temperature 16 degrees C; dissolved oxygen 8.2 mg/1; pH 5.5; color 140 P-C units; total iron 0.45 mg/1; turbidity 25 JTU; alkalinity 5 mg/1; and hardness 15 mg/1. Total N, NO_3 and PO_4 were at levels below the instrument's detection capability. The drainage area above the test site is about 150 square miles.

A brief summary of PL-566 activities in the South Atlantic-Gulf region, 276,000 square miles, is as follows: (a) 347 projects, 35,670 square miles (13%), have been authorized for planning, (b) 265 projects, 22,131 square miles (8%), have been approved for operations, (c) 64 projects

2,890 square miles (1%), have been completed. Subregion 6 has a drainage area of 37,000 square miles (12%), in which thirteen PL-566 projects have been installed. The total drainage area of these projects is about 800 square miles. Effects of this single project on the subregion would be small.

Cumulative effects of all projects within the South Atlantic-Gulf Region are not available. Developing effects for such a vast area is beyond the scope of this plan. Consequently cumulative impacts were considered for the Satilla River Basin. This river basin, in which the watershed is located, represents 9.5 percent of Subregion 6 and 1.3 percent of the South Atlantic-Gulf Region.

Cumulative effects on flood stages in this river basin were developed considering three operational projects, this proposed project, and potential projects. This evaluation on the Satilla immediately downstream from the confluence with the Alabaha showed an increase of 0.1 foot for the 3-year flood and an increase of less than 0.1 foot for the 50-year flood. Evaluation of the Satilla near Dover Bluff showed no measurable change in flood stage.

The cumulative effects of water management after installation of this plan, in conjunction with other projects in the Satilla Basin, will not be detrimental to the trees and other vegetation in the flood plain downstream.

The existing and proposed channel work of the projects within the Satilla Basin is located to drain cropland, pastureland, and wooded areas that consist of pine stands. Drainage provided in the pine woodlands will influence the understory vegetation within the project areas. Such vegetation as myrtle, gallberry, and palmetto may be reduced and replaced by broomsedge, pancium, and switchgrass.

This change will occur only in the areas in which drainage and timber management are carried out. Since this consists of less than 1 percent of the total basin area, cumulative impacts on wetland or upland flora can be considered insignificant.

Fish and Wildlife and Recreation

No wetlands of high value to wildlife will be affected by the project structural measures. The owners of an area of approximately 112 acres of Type 7 wetland will be encouraged to manage it more intensively as a part of the conservation land treatment program. The area has an old man-made dam that could be modified to facilitate manipulation of water levels to allow plantings and subsequent flooding for waterfowl enhancement and hardwood production.

Landowners are expected to construct approximately 2 additional farm ponds with a total surface area of about 6 acres. During the course of rendering technical assistance to landowners in planning and applying

conservation land treatment, emphasis will be placed on management of these new ponds and existing ponds for fee-fishing enterprises with adequate sanitary waste disposal facilities.

It is expected that open surface water for wildlife purposes will be more plentiful in dry periods as a result of the project since experience has shown that constructed canals in pine and agricultural flat land will contain water most of the time. These flats are subject to periodic flooding and saturated soil conditions, but few if any areas hold surface water for extended periods. Aquatic species of wildlife that associate with aquatic ecosystems, will be expanded by the water-holding characteristics of constructed channels. Under present conditions, the USGS stream gage on Hurricane Creek 1.5 miles north of Alma records no flow at times each year even though the drainage area is approximately 150 square miles.

Archeological and Historical

All evidence derived from the archeological study indicates that the proposed project will not adversely affect any cultural resources in the Mill Branch Watershed.

Economic and Social

Installation of this project will generate additional income in the form of increased man-hours needed to harvest and process the increased amounts of forest and agricultural products. Improved growth, access, and regeneration will provide an average annual net increase in returns of approximately $11.00 per acre from protected forest land. Planned conservation measures will permit an increase in beef yields from about 200 to 450 pounds per acre; corn from 60 to 120 bushels per acre; tobacco from 1,800 to 2,200 pounds per acre; and soybeans from 20 to 30 bushels per acre. Vegetable crops will show an even greater increase in yields than the regular field crops.

Project improvement will allow much quicker removal of standing water in yards, gardens, and lots. Direct favorable effects should be immediately apparent in relieving some floodwater-type mosquito problems by removal of floodwater prior to development of mosquitoes. About 90 percent of the mosquito problem in the Coastal Plain is caused by floodwater types.

The economic plight of low income families residing on small tracts of land will be improved by the availability of outlets for disposal of water from vegetable gardens and yards. Some insight into their poverty level can be derived from the fact that per capita income in Bacon County is only $2,311. This is about 59 percent of the national level. Out of economic necessity these less advantaged people live in the wettest areas where it is hard to grow good crops of vegetables and to have suitable pastures for livestock. Increased yields of better quality

vegetables where low income residents have an urgent need for improved diets will be possible after the project is installed.

Forest land soils within the zone of influence of proposed project channels are not suitable for agronomic crops. Damage reduction and improved efficiency benefits to the existing land are sufficient to justify the project from an economic standpoint. Damages to agriculture, forestry, and roads will be reduced by 70 percent.

Increased agricultural production that will accrue due to project installation will create new demands in agriculturally related businesses. An estimated additional $34,000 will be spent annually for farm supplies. An additional $23,700 will be spent annually for harvesting and marketing services. An additional 1,040 man-days of seasonal labor will result from increased agricultural production.

Approximately 2.8 skilled and 22.5 semi-skilled jobs will be created by funds spent during project installation, and 7.9 permanent skilled and 15.8 permanent semi-skilled jobs will be created as a result of direct project benefits. In addition 1.7 permanent semi-skilled jobs will result from operation and maintenance of project measures. Creation of these new jobs will help stem population decline in Bacon County.

Floodwater reduction and drainage will improve living conditions. Better farm outlets for floodwater and drainage will; improve efficiency of agriculture by insuring timely planting, help eliminate the need for replanting, thereby reducing production costs, insure timely harvest of crops and forest products, and provide accessibility to forest areas for management. The project will provide for less frequent interruption of traffic, and it will also reduce the need for road repairs. Funds previously needed for repairs can be used for other things that improve the quality of life. Eliminating these inefficiencies will increase incomes and make the entire area a more desirable place in which to live.

Project action will not adversely affect those limited recreational opportunities that have been identified within the project.

Other

A summary of area by land use committed by the installation of structural measures is as follows:

Approximately 7 acres of cropland is to be replaced by new channels.

Approximately 44 acres of forest land is to be replaced by new channels.

Approximately 211 acres of forest land is to be cleared for rights-of-way and later re-vegetated.

Production from the cropland and forest land to be occupied by channels will be lost. Forest land wildlife habitat will also be lost on 44

acres; however, as the channel vegetation improves, a habitat for various other life forms will develop. Loss of forest land wildlife habitat on 211 acres to be cleared for rights-of-way will be temporary.

PROJECT BENEFITS

Average annual flood prevention benefits, including indirect benefits, will accrue as follows: crop and pasture, $45,273; forest land, $15,669; roads, $28,300; and indirect, $8,924. These figures include $900 benefits expected to be derived from land treatment measures (Table 6).

Agricultural water management benefits are estimated to be $60,941.

Secondary benefits amounting to $43,749, annually will result from increased business to wholesalers, processors, and suppliers in the immediate trade area. Secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation.

Redevelopment benefits amounting to $12,427 annually will result in increased employment in the area, this will help stem migration of young people from the county.

Some other benefits growing out of the project which were not evaluated monetarily are as follows: (1) increase in efficiency of farming and increase in value of land resulting from application of accelerated conservation land treatment programs; (2) increase in incidental drainage benefits to the municipal airport and industrial park; (3) reduction of floodwater-type mosquito breeding areas; (4) increase in benefits to wildlife resulting from drinking water being available in the open channels for longer periods than it is now in much of the watershed and resulting from increased food and cover plantings; (5) supplementation of existing ponds through pond construction and management which will assure continuous restocking of streams with escape fish; (6) increase in wildlife preferred food plants such as blackberry, smilax, oak, ragweed, and partridge pea which experience has shown begins to grow along immediate area of canal installations; (7) reduction of flooding in quail nesting areas; (8) improvement of conditions around rural homes; (9) increase in efficiency of equipment used in harvesting and regenerating forest stands, and (10) benefits to wildlife through prescribed burning of pine forest lands.

COMPARISON OF BENEFITS AND COSTS

The estimated average annual cost of the structural measures is $77,286 which includes $17,547 for operation and maintenance (Table 4). Estimated average annual benefits, excluding local secondary benefits, amount to $170,634, resulting in a benefit-cost ratio of 2.2:1.0. With local secondary benefits of $43,749 included, the benefit-cost ratio is 2.8:1.0. Table 6 shows benefit-cost ratios for individual channels and groups of channels.

PROJECT INSTALLATION

Conservation Land Treatment Measures

Provisions for installing the needed soil and water conservation practices, including wildlife habitat development and preservation, will be included in individual conservation plans developed by landowners and operators with technical assistance from the Altamaha Soil and Water Conservation District and forest management plans developed by the Georgia Forestry Commission in cooperation with the U.S.Forest Service. The Georgia Game and Fish Division, in cooperation with the U.S. Fish and Wildlife Service, and the Soil Conservation Service will provide technical assistance needed in the establishment of fish and wildlife measures. Landowners and operators, using cost-sharing from the Rural Environmental Conservation Program (RECP) will install the normal conservation measures within the 5 year installation period. PL-566 funds will be utilized to purchase lime, fertilizer, seed, planting stock, and mulch for stabilizing approximately 10 acres of severely eroding land on farms. Landowners will furnish labor and machinery to implement these measures.

The Cooperative Extension Service will provide educational, informational, and other assistance of value in expediting project installation. The Farmers Home Administration will provide loan service as needed for qualified purposes.

Forest landowners will be encouraged to apply and maintain the forestry measures on their lands. The Georgia Forestry Commission, cooperating with the U.S. Forest Service, will provide technical assistance in the planning and application of forestry practices designed to increase the landowners' return from the various products and uses of a forest. Among these products and uses are the following: pulpwood, sawtimber, naval stores, recreation, and wildlife. Educational information, as well as assistance in achieving these objectives, are presently available through the Georgia Forestry Commission, U.S. Forest Service, Georgia Game and Fish Division, U.S. Fish and Wildlife Service, Soil Conservation Service, Extension Service, and others. Forest management recommendations to forest landowners will identify multiple-use opportunities where possible. The basic plan under which most of the resource conservation practices on this watershed will be carried out is the Conservation Plan of the individual landowner. Therefore, a primary objective of the forester assigned to this project will be the preparation of watershed management plans for the forest land as a part of the total conservation planning effort. This will result in the landowner receiving maximum benefits from the watershed program and will benefit the entire area through an improved environment.

Technical assistance available through the existing soil conservation district and forestry programs will be supplemented by project funds to accelerate planning and application sufficiently to complete the most essential components during the installation period. Non-forest land

treatment goals have been tabulated by land use, land capability classes, and location within the watershed. Goals have been established to accomplish one-fifth of the needed practices each year of the installation period. Mutual agreement has been reached by the Soil Conservation Service, the U. S. Forest Service, and the Altamaha Soil and Water Conservation District Supervisors; and the annual goal priorities have been recorded. Some conservation practices included in the overall goals are contingent upon installation of structural measures, and these will be installed after the normal project installation program.

Structural Measures

Structural measures will be installed over a five-year period. The first year will be spent by the Sponsoring Local Organization in securing land rights and preparing for the first construction contract. The Soil Conservation Service will prepare designs during the first year for the construction unit which is to be installed first. Agreement upon the amount and kind of construction that Bacon County will undertake to pay its share of costs of multiple purpose channels will be reached.

The estimated value of the work Bacon County is to perform does not exceed the County's share of the cost-shared items. The price for the work will be established by negotiations between the Service and Bacon County, and this estimated price will be included in the project agreement covering the work. A financial settlement will be made between the Service and the County upon the completion of work covered by each project agreement. This action is in the interest of the project, the watershed program, and the federal government. Bacon County has the necessary equipment and work force and is skilled in performing the type of work contemplated. They are accomplishing similar work very efficiently and satisfactorily in the operational Ten Mile-Briar Creek watershed project. Performance will conform to drawings and specifications approved by the Service and will be in accordance with an agreed upon time schedule. The sponsors will assume full financial and other responsibility, which would be the responsibility of a contractor if the work were performed by contract, for any work that must be torn out, replaced, or repaired because of construction error or other causes.

The types of work Bacon County will perform include clearing channel rights-of-way of unsalvaged trees and brush not marked to be left for wildlife purposes and/or in some instances excavation if clearing does not equal their share of the construction cost.

Bacon County Government has requested that the Soil Conservation Service administer contracts. Successive activities by the Service and the County will progress in like manner. Close liaison between Bacon County Commissioners and the Soil Conservation Service will be maintained to coordinate progress, to maintain schedules, and to meet needs and obligations.

Bacon County will be responsible for construction inspection and administrative actions as needed to protect its interest, particularly where roads, bridges, and culverts are involved.

The Service will initiate structural measure surveys and investigations, provide engineering services, project administration and other related services as needed (Table 1 and 2). These include detailed site surveys, site investigations, design, preparation of plans and specifications, layout, construction inspection, consultation with Bacon County representatives and other related forms of assistance authorized by PL-566. The County and the Service will each bear the project administration costs that it incurs.

Each individual channel is a construction unit within itself since each is economically justified in the absence of the remaining works of improvement. Mains which laterals are dependent upon for outlets will be constructed first. Long, expensive channels can be constructed in segments progressing from the outlet upstream.

All land rights for a given unit of construction will be acquired by Bacon County prior to the initiation of each contract. Included in the land rights are needed easements and rights-of-way, including all legal fees and other administrative costs. Bacon County has sufficient legal authority (including the power of eminent domain) and funds, and agrees to use such authority and funds, if necessary, to acquire all land rights needed for the project.

A project agreement is to be entered into by the County and the Service prior to the issuance of invitations to bid for construction of each unit. This agreement will outline specific agreements between the County and the Service regarding construction, including cost-sharing and compliance with laws, permits, regulations or agreements related thereto. The Service will consult with the County as necessary in the accomplishment of the agreement.

FINANCING PROJECT INSTALLATION

Federal assistance in accomplishment of works of improvement on non-federal land as described in this work plan will be provided under authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666) as amended. Financial and other assistance to be furnished by the Service and other federal agencies is contingent upon the appropriation of funds for this purpose.

The Sponsoring Local Organization has adequate funds for organizational expenses. Bacon County has tax and general revenue sources common to most units of local government and is experienced in watershed work. The Altamaha Soil and Water Conservation District has state appropriations and revenue from other sources. The enthusiastic interest of landowners as expressed at several public meetings indicates land rights acquisition will not be a problem.

Landowners attending public meetings during plan development and those interviewed on farms have indicated they are willing to install needed conservation practices with applicable cost sharing assistance under programs administered by the Agricultural Stabilization and Conservation Service and technical help from the Altamaha Soil and Water Conservation District and the Georgia Forestry Commission.

The cost estimates for installing the forestry phase of the program were developed by the U.S. Forest Service and the Georgia Forestry Commission. Installation costs of the forest land treatment measures are based on current cost of supervision, labor, equipment, and materials necessary to accomplish the specific measures. Technical assistance costs are based on actual expenditures and accomplishments of the Georgia Forestry Commission. An analysis of costs and accomplishments was made for each measure to determine unit costs for technical assistance. Installation and maintenance costs for forest land treatment measures included in this plan will be provided by landowners and operators on whose lands the measures will be applied. Technical assistance costs for planning and applying these measures on small private lands will be borne by the U.S. Forest Service and the Georgia Forestry Commission as described under EXPLANATION OF INSTALLATION COST for small private ownerships; these costs will be borne by the industrial companies on their land.

PROVISIONS FOR OPERATION AND MAINTENANCE

Agricultural and forest land treatment measures will be maintained by landowners and operators under terms of agreements with the Altamaha Soil and Water Conservation District. The industrial owners and operators of forest land will furnish the technical assistance necessary for operating and maintaining the measures on their lands. The Georgia Forestry Commission will continue to furnish both management assistance to small private landowners through the existing Cooperative Forest Management Program and fire control activities through the existing Cooperative Forest Fire Control Program.

The Georgia Game and Fish Division and the Soil Conservation Service will provide technical assistance to interested landowners in preserving or enhancing wildlife and fisheries resources.

Bacon County will be responsible for operation and maintenance of approximately 229,500 feet of multiple purpose open channels and the emergency spillways of three farm ponds discussed in the section entitled WORKS OF IMPROVEMENT TO BE INSTALLED. The estimated annual O&M cost is $17,547. An establishment period shall extend 3 years from the date channel work is completed. During the establishment period the State Conservationist may approve PL-566 cost sharing for any additional work required to obtain an adequate vegetative cover. Approval of the Administrator is required for PL-566 cost sharing for other repair or additional work on completed channels. Cost sharing will not exceed the ratio authorized for the original construction. Bacon County agrees to maintain structural measures in accordance with state and local health regulations.

The County Commissioners have already purchased heavy equipment for the purpose of accomplishing the county's share of construction, operation, and maintenance in Ten Mile Briar Creek operational watershed and Mill Branch when it becomes operational.

Specific operation and maintenance plans and agreements will be developed for each structural measure prior to execution of land rights, relocation, or project agreements. These agreements will contain a reference to the State Watersheds Operation and Maintenance Handbook. Representatives of the Soil Conservation Service and Bacon County will make a joint inspection annually or after unusually severe floods for 3 years following installation of channels. Inspection after the third year will be made annually by Bacon County, and a report will be prepared by them and a copy sent to the Soil Conservation Service representative. The Altamaha Soil and Water Conservation District may assist Bacon County with these inspections. The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with PL-566 financial assistance.

Maintenance of conservation land treatment measures will consist mostly of mowing, fertilizing, liming, and proper plowing of terraces and maintaining other water disposal practices. Maintenance likely to be

needed on the improved channels will consist of replacing galvanized asphalt coated corrugated metal pipe, keeping channels clear of obstructions such as tree tops, brush, debris, and dense vegetation that may tend to block normal flow, and replacing rock that may be dislodged from the temporary environmental protection weirs. If at some point in time these structures are no longer functional, they will be removed and the sites shaped and vegetated. It is not anticipated that there will be large deposits of sediment in the channel and required resectioning of channels will occur at intervals of 25 to 50 years.

Maintenance will be accomplished in a manner designed to disturb established vegetation as little as possible. Areas disturbed will be revegetated immediately.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Mill Branch Watershed, Georgia

Installation Cost Item	Unit	Number		Estimated Cost (Dollars) 1/						
				PL 566 Funds			Other			
		Non-Fed.		Non-Fed. Land			Non-Fed. Land			
		Land	Total	SCS 2/	FS 2/	Total	SCS 2/	FS 2/	Total	TOTAL
LAND TREATMENT 3/										
Cropland	Acres	4,850	4,850				202,200		202,200	202,200
Pastureland	Acres	150	150				35,600		35,600	35,600
Forest land	Acres	4,800	4,800					96,800	96,800	96,800
Other land	Acres	80	80				1,200		1,200	1,200
Going Coop. Forest Management Program								3,700	3,700	3,700
Going Coop. Forest Fire Control Program								19,400	19,400	19,400
Critical Area Stabilization Field	Acres	10	10	2,100		2,100	900		900	3,000
Technical Assistance				31,100	16,200	47,300	15,400	3,200	18,600	65,900
TOTAL LAND TREATMENT	XXXXX	XXXXX	XXXXX	33,200	16,200	49,400	255,300	123,100	378,400	427,800
STRUCTURAL MEASURES										
Construction										
Channel Work 4/										
Multiple Purpose										
N	Feet	1,700	1,700	8,250		8,250	2,750		2,750	11,000
M	Feet	13,100	13,100	34,050		34,050	11,350		11,350	45,400
O	Feet	214,700	214,700	483,900		483,900	161,300		161,300	645,200
Subtotal-Construction		229,500	229,500	526,200		526,200	175,400		175,400	701,600
Engineering Services				105,900		105,900				105,900
Project Administration										
Construction-Inspection				19,600		19,600	1,400		1,400	21,000
Other				78,600		78,600	5,600		5,600	84,200
Subtotal - Administration				98,200		98,200	7,000		7,000	105,200
Other Costs										
Land Rights							60,100		60,100	60,100

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Mill Branch Watershed, Georgia

Installation Cost Item	Unit	Number		Estimated Cost (Dollars) 1/						
				PL 566 Funds			Other			
		Non-Fed. Land	Total	Non-Fed. Land			Non-Fed. Land			TOTAL
				SCS 2/	FS 2/	Total	SCS 2/	FS 2/	Total	
Subtotal - Other							60,100		60,100	60,100
TOTAL STRUCTURAL MEASURES				730,300		730,300	242,500		242,500	972,800
TOTAL PROJECT				763,500	16,200	779,700	497,800	123,100	620,900	1,400,600

1/ Price Base: 1976

2/ Federal agency responsible for assisting in installation of works of improvement.

3/ Includes only areas estimated to be adequately treated during project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts applied to total land areas, not just to adequately treated areas.

4/ Type of channel prior to project; (N) an unmodified, well defined channel or stream; (M) man-made ditch or previously modified channel; (O) none or practically no defined channel.

Date: April 1976

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
(at time of Work Plan Preparation)

Mill Branch Watershed, Georgia

Measures	Unit	Applied to Date	Total Cost (Dollars) 1/
LAND TREATMENT			
Conservation Cropping Systems	Acres	2,600	7,950
Crop Residue Use	Acres	2,500	9,250
Land Smoothing	Acres	300	5,400
Field Border	Feet	5,000	7,500
Wildlife Habitat Mgt. (plantings)	Acres	150	7,500
Critical Area Planting (Field)	Acres	3	900
Pasture and Hay Planting	Acres	600	3,600
Proper Grazing Use	Acres	200	1,200
Tree Planting	Acres	2,000	60,000
Improvement Cuttings	Acres	7,000	7,000
Going Coop. Forest Fire Control Program			17,000
STRUCTURAL MEASURES			
Irrigation Pit	No.	30	31,500
Drainage Field Ditches	Feet	14,000	2,800
Drainage Field Laterals	Feet	16,500	7,260
Tile Drains	Feet	80,000	40,000
Farm Ponds	No.	23	80,500
TOTAL XXXXX	XXXXXX	289,360	

1/ Price Base: 1976

Date: April 1976

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Mill Branch Watershed, Georgia

(Dollars) 1/

Item	Type of Channel Before Project	Installation Cost PL 566 Funds			Installation Cost - Other Funds			Total Installation Cost
		Construction	Engineering	Total PL 566	Construction	Land Rights	Total Other	
Multiple Purpose Channels								
3 B	0	7,875	1,600	9,475	2,625	900	3,525	13,000
Little Bear, 1 LB, 2 LB, 3 LB, 4 LB	0	16,425	3,400	19,825	5,475	1,700	7,175	27,000
Mill Br. 17+00 to 151+00 1 M, 3 M, 4 M, 6 M, 7 M, 8 M, 9 M	0	53,775	10,800	64,575	17,925	8,000	25,925	90,500
Hog Br., 1 H, 2 H, 3 H, 4 H, 5 H	0	32,325	6,500	38,825	10,775	4,300	15,075	53,900
Mill Br. 151+00 to 208+00 10 M, 11 M, 12 M, 13 M	0	35,925	7,200	43,125	11,975	4,800	16,775	59,900
14 M, 15 M, 16 M, 17 M, 18 M	0 3/	34,275	6,900	41,175	11,425	5,500	16,925	58,100
Mill Br. 208+00 to 330+00 19 M, 20 M, 21 M, 24 M, 26 M, 27 M, 28 M	0 4/	96,825	19,600	116,425	32,275	6,600	38,875	155,300
30 M	0	3,525	700	4,225	1,175	300	1,475	5,700
31 M, 32 M, 32 M-1	0	19,275	3,900	23,175	6,425	2,100	8,525	31,700
33 M, 35 M, 36 M	0 5/	40,275	8,000	48,275	13,425	4,100	17,525	65,800
37 M	0	3,525	700	4,225	1,175	300	1,475	5,700
39 M	0	9,750	2,000	11,750	3,250	800	4,050	15,800
41 M	0	4,350	900	5,250	1,450	400	1,850	7,100
42 MA	0	3,000	600	3,600	1,000	400	1,400	5,000
43 M	0	5,550	1,100	6,650	1,850	400	2,250	8,900
44 M, 46 M, 47 M	0	23,175	4,600	27,775	7,725	2,000	9,725	37,500
48 M	0	9,225	1,800	11,025	3,075	900	3,975	15,000
49 M	0	5,475	1,100	6,575	1,825	400	2,225	8,800
1 R	0	3,375	700	4,075	1,125	200	1,325	5,400
2 R	0	2,325	500	2,825	775	100	875	3,700
5 R, 8 R, 10 R, 11 R, 12 R, 18 R, 19 R, 20 R, 21 R, 22 R, Rigdon	0 6/	60,225	12,000	72,225	20,075	10,600	30,675	102,900
	0	55,725	11,300	67,025	18,575	5,300	23,875	90,900
Subtotal Watershed		526,200	105,900	632,100	175,400	60,100 2/	235,500	867,600
Project Administration		XXXXXXX	XXXXXXX	98,200	XXXXXXX	XXXXXX	7,000	105,200
GRAND TOTAL		526,200	105,900	730,300	175,400	60,100 2/	242,500	972,800

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRUBUTION

Mill Branch Watershed, Georgia

(Dollars) 1/

1/ Price Base: 1976

2/ Includes $30,800 for relocation of fixed improvements.

3/ Approximately 300 feet of 15 M is classified as "M" and represents a cost of approximately $800.

4/ Approximately 1,700 feet of Mill Branch is calssified as "N" and represents a construction cost of approximately $11,000. Remaining portion of unit classified as "O".

5/ Approximately 9,100 feet of 33 M and 35 M is classified as "M" and represents a construction cost of approximately $31,500. Remaining portion of unit classified as "O".

6/ Approximately 3,700 feet of 5 R is classified as "M" and represents a construction cost of approximately $13,900. Remaining portion of unit classified as "O".

Date: April 1976

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Mill Branch Watershed, Georgia

(Dollars) 1/

Item	COST ALLOCATION			COST SHARING					
	PURPOSE			PL 566			OTHER		
	Flood Prevention	Drainage	Total	Flood Prevention	Drainage	Total	Flood Prevention	Drainage	Total
Multiple Purpose Channels	433,800	433,800	867,600	403,750	228,350	632,100	30,050	205,450	235,500
TOTAL	433,800	433,800	867,600	403,750	228,350	632,100	30,050	205,450	235,500

1/ Price Base: 1976

Date: April 1976

TABLE 3 - STRUCTURE DATA - CHANNELS

Mill Branch Watershed, Georgia

Channel (No. or Name)	Sta. or Reach (ft)	Water-shed Area (SqMi)	Equiv. Drain-age Area (SqMi)	Required Drainage Curve	Capacity cfs		Hydraulic Gradient (ft/ft)	Channel Dimensions 2/		"n" Value	Velocities		Excava-tion (CuYds)	Type of Work 4/	Before Project	
					Req'd	Design		Bottom (ft)	Depth (ft) 1/	Aged 3/	Aged (ft/sec)	As Built (ft/sec)			Type of Channel	Flow Condition 5/
Lat. 3 B	20+00	0.06	0.06	63.7m$^{5/6}$												
	44+50	0.32	0.32	"	25	25	.002	3	3.0	.045	1.85	3.33	2,600	I	0	E
	59+00	0.37	0.37	"	28	28	.0025	3	3.0	.045	2.06	3.72	1,500	I	0	E
Li. Bear Branch	36+00	0.06	0.06	63.7m$^{5/6}$												
	44+00	0.08	0.08	"	8	9	.00025	3	3.0	.045	0.65	1.18	800	I	0	E
	58+00	0.21	0.21	"	18	21	.0003	4	4.0	.045	0.86	1.57	1,900	I	0	E
	74+00	0.41	0.41	"	30	29	.0006	4	4.0	.045	1.22	2.18	2,200	I	0	I
	88+00	0.47	0.47	"	34	38	.001	4	4.0	.045	1.57	2.83	2,000	I	0	I
	103+00	0.68	3.59	12.7m$^{5/6}$	35	38	.001	4	4.0	.045	1.57	2.83	2,000	I	0	I
Lat. 1 LB	34+00	0.01	0.01	63.7m$^{5/6}$												
	44+00	0.04	0.04	"	4	12	.0005	3	3.0	.045	0.92	1.66	800	I	0	E
Lat. 2 LB	38+00	0.03	0.03	63.7m$^{5/6}$												
	44+00	0.04	0.04	"	4	8	.0002	3	3.0	.045	0.58	1.05	500	1	0	E
Lat. 3 LB	47+00	0.01	0.01	63.7m$^{5/6}$												
	58+00	0.04	0.04	"	4	8	.0002	3	3.0	.045	0.58	1.05	900	I	0	E
Lat. 4 LB	83+00	0.01	0.01	63.7m$^{5/6}$												
	88+00	0.02	0.02	"	2	6	.0001	3	3.0	.045	0.41	0.70	500	1	0	E
Mill Br.	17+00	0.05	0.05	63.7m$^{5/6}$												
	35+00	0.18	0.18	"	15	19	.0004	3	4.0	.045	0.93	1.68	2,200	I	0	E
	68+00	0.66	0.66	"	45	47	.0008	5	4.0	.040	1.67	2.68	5,200	I	0	E
	102+00	1.09	1.02	"	64	65	.0008	7	4.0	.040	1.81	2.89	7,300	I	0	E
	108+00	1.29	1.22	"	75	74	.0008	8	4.0	.040	1.86	2.96	1,300	1	0	I
	127+00	1.61	1.54	"	91	94	.0008	10	4.0	.040	1.95	3.12	4,900	1	0	1
	151+00	1.77	1.70	"	100	103	.0008	11	4.0	.040	1.99	3.18	6,500	I	0	I
	155+00	3.05	2.21	"	124	123	.0008	13	4.0	.040	2.05	3.28	1,500	I	0	I
	178+00	3.20	2.36	"	133	141	.00075	14	4.2	.040	2.07	3.30	9,900	I	0	1
	189+00	3.30	17.05	12.7m$^{5/6}$	135	141	.00075	14	4.2	.040	2.07	3.30	4,800	I	0	I
	204+00	3.49	17.24	"	136	141	.00075	14	4.2	.040	2.07	3.30	6,600	1	0	I
	208+00	3.60	17.35	"	137	141	.00075	14	4.2	.040	2.07	3.30	1,700	1	0	1
	225+00	4.72	25.03	"	186	184	.00075	17	4.4	.040	2.19	3.49	8,500	I	0	1

TABLE 3 - STRUCTURE DATA - CHANNELS

Mill Branch Watershed, Georgia

Channel (No. or Name)	Sta. or Reach (ft)	Watershed Area (SqMi)	Equiv. Drainage Area (SqMi)	Required Drainage Curve	Capacity cfs		Hydraulic Gradient (ft/ft)	Channel Dimensions 2/		"n" Value Aged 3/	Velocities		Excavation (CuYds)	Type of Work 4/	Before Project	
					Req'd	Design		Bottom (ft)	Depth (ft) 1/		Aged (ft/sec)	As Built (ft/sec)			Type of Channel	Flow Condition 5/
Mill Br. (continued)	232+00	5.06	26.18	"	193	191	.00075	17	4.5	.040	2.21	3.53	3,400	I	O	I
	258+00	5.47	26.94	"	198	198	.00075	17	4.6	.040	2.23	3.57	14,100	I	O	I
	293+00	5.88	9.53	31.9m 5/6	207	206	.001	17	4.4	.040	2.47	4.04	14,800	I	O	I
	313+00	6.58	9.94	"	214	90 7/	.001	17	2.6	.040	1.90	3.10	5,200	I	O	I
	330+00	7.31	10.49	"	0	0 6/	.001	17	2.6	.040	1.90	3.10	6,600	II	N	I
Lat. 1 M	26+00	0.03	0.03	63.7m 5/6												
	35+00	0.05	0.05	"	5	14	.0006	3	3.0	.045	1.01	1.82	800	I	O	E
Lat. 3 M	56+00	0.04	0.04	12.7m 5/6												
	68+00	0.08	0.08	"	2	9	.00025	3	3.0	.045	0.65	1.15	1,100	I	O	E
Lat. 4 M	49+00	0.08	0.08	63.7M 5/6												
	68+00	0.13	0.13	"	12	17	.0009	3	3.0	.045	1.24	2.23	2,100	I	O	E
Lat. 6 M	78+00	0.07	0.07	63.7m 5/6												
	102+00	0.16	0.16	"	14	24	.002	3.0	3.0	.045	1.80	3.33	3,500	I	O	E
Lat. 7 M	67+00	0.05	0.05	63.7m 5/6												
	78+00	0.07	0.07	"	7	16	.0008	3.0	3.0	.045	1.17	2.10	1,200	I	O	E
	108+00	0.25	0.25	"	20	20	.0008	4.0	3.0	.045	1.24	2.24	3,200	I	O	E
Lat. 8 M	69+00	0.02	0.02	12.7m 5/6												
	78+00	0.06	0.06	"	1	1	.0005	3.0	3.0	.045	0.92	1.66	1,000	I	O	E
Lat. 9 M	121+00	0.03	0.03	63.7m 5/6												
	127+00	0.05	0.05	"	5	12	.0005	3.0	3.0	.045	0.92	1.66	600	I	O	E
Lat. 10 M	147+00	0.01	0.01	63.7m 5/6												
	155+00	0.02	0.02	"	2	18	.001	3.0	3.0	.045	1.31	2.35	1,000	I	O	E
Lat. 11 M	171+00	0.03	0.03	63.7m 5/6												
	178+00	0.05	0.05	"	5	18	.001	3.0	3.0	.045	1.31	2.35	900	I	O	E
Lat. 12 M	169+00	0.02	0.02	12.7m 5/6												
	189+00	0.14	0.14	"	3	21	.0015	3.0	3.0	.045	1.59	2.88	2,400	I	O	E

TABLE 3 - STRUCTURE DATA - CHANNELS

Mill Branch Watershed, Georgia

Channel (No. or Name)	Sta. or Reach (ft)	Water-shed Area (SqMi)	Equiv. Drain-age Area (SqMi)	Required Drainage Curve	Capacity cfs		Hydraulic Gradient (ft/ft)	Channel Dimensions 2/		"n" Value	Velocities		Excava-tion (CuYds)	Type of Work 4/	Before Project	
					Req'd	Design		Bottom (ft)	Depth (ft) 1/	Aged 3/	Aged (ft/sec)	As Built (ft/sec)			Type of Channel	Flow Condition 5/
Lat. 13 M	188+00	0.03	0.03	$63.7m^{5/6}$												
	204+00	0.08	0.08	"	8	20	.00125	3.0	3.0	.045	1.45	2.56	1,800	I	O	E
Lat. 14 M	148+00	0.07	0.07	$63.7m^{5/6}$												
	158+00	0.10	0.10	"	9	9	.0001	4.0	3.4	.045	0.46	0.83	1,500	I	O	E
	186+00	0.23	0.21	"	17	18	.001	3.0	3.0	.045	1.31	2.35	3,400	I	O	E
	193+00	0.48	0.46	"	35	34	.0008	4.0	4.0	.045	1.40	2.59	1,200	I	O	I
	208+00	1.04	1.02	"	68	65	.0008	7.0	4.0	.040	1.80	2.89	3,000	I	O	I
Lat. 15 M	137+00	0.09	0.09	$63.7m^{5/6}$												
	189+00	0.35	0.35	"	27	36	.002	3.0	3.0	.045	1.85	3.33	7,700	I 8/	O 8/	E
	193+00	0.45	0.45	"	33	35	.001	4.0	3.8	.045	1.55	2.78	700	I	O	E
Lat. 16 M	153+00	0.04	0.04	$63.7m^{5/6}$												
	167+00	0.07	0.07	"	7	18	.001	3.0	3.0	.045	1.31	2.35	1,900	I	O	E
	186+00	0.22	0.22	"	18	21	.0015	3.0	3.0	.045	1.59	2.88	2,400	I	O	E
Lat. 17 M	154+00	0.03	0.03	$63.7m^{5/6}$												
	167+00	0.07	0.07	"	7	21	.0015	3.0	3.0	.045	1.59	2.88	1,600	I	O	E
Lat. 18 M	150+00	0.01	0.01	$12.7m^{5/6}$												
	158+00	0.03	0.03	"	1	6	.0001	3.0	3.0	.045	0.41	0.74	1,000	I	O	E
Lat. 19 M	169+00	0.05	0.05	$63.7m^{5/6}$												
	184+00	0.13	0.13	"	12	21	.0015	3.0	3.0	.045	1.59	2.87	1,500	I	O	E
	208+00	0.21	0.21	$12.7m^{5/6}$	13	21	.0015	3.0	3.0	.045	1.59	2.87	2,100	I	O	E
	225+00	0.32	1.13	"	14	21	.0015	3.0	3.0	.045	1.59	2.87	2,300	I	O	E
Lat. 20 M	196+00	0.02	0.02	$12.7m^{5/6}$												
	208+00	0.07	0.07	"	1	21	.0015	3.0	3.0	.045	1.59	2.87	1,400	I	O	E
Lat. 21 M	223+00	0.06	0.06	$63.7m^{5/6}$												
	232+00	0.08	0.43	$12.7m^{5/6}$	6	18	.001	3.0	3.0	.045	1.30	2.34	900	I	O	E
Lat. 24 M	245+00	0.02	0.02	$63.7m^{5/6}$												
	258+0	0.10	0.10	"	9	21	.0015	3.0	3.0	.045	1.59	2.87	1,400	I	O	E

TABLE 3 - STRUCTURE DATA - CHANNELS

Mill Branch Watershed, Georgia

Channel (No. or Name)	Sta. or Reach (ft)	Water-shed Area (SqMi)	Equiv. Drain-age Area (SqMi)	Required Drainage Curve	Capacity cfs		Hydraulic Gradient (ft/ft)	Channel Dimensions 2/		"n" Value	Velocities		Excava-tion (CuYds)	Type of Work 4/	Before Project	
					Req'd	Design		Bottom (ft)	Depth (ft) 1/	Aged 3/	Aged (ft/sec)	As Built (ft/sec)			Type of Channel	Flow Condition 5/
Lat. 26 M	210+00	0.03	0.03	12.7m 5/6												
	268+00	0.42	0.42	"	12	18	.001	3.0	3.0	.045	1.30	2.34	5,300	1	O	E
	293+00	0.61	0.32	31.9m 5/6	12	18	.001	3.0	3.0	.045	1.30	2.34	1,700	1	O	E
Lat. 27 M	265+00	0.15	0.15	12.7m 5/6												
	275+00	0.17	0.17	"	3	18	.001	3.0	3.0	.045	1.30	2.34	1,000	I	O	E
	313+00	0.43	0.77	"	10	15	.00075	3.0	3.0	.045	1.13	2.03	4,000	I	O	E
Lat. 28 M	271+00	0.04	0.04	63.7m 5/6												
	275+00	0.06	0.06	"	6	9	.00025	3.0	3.0	.045	0.65	1.18	500	I	O	E
Lat. 30 M	340+00	0.02	0.02	12.7m 5/6												
	355+00	0.12	0.12	63.7m 5/6	11	25	.002	3.0	3.0	.045	1.84	3.32	1,700	I	O	E
Lat. 31 M	320+00	0.08	0.08	63.7m 5/6												
	335+00	0.13	0.58	12.7m 5/6	9	21	.0015	3.0	3.0	.045	1.59	2.87	1,300	I	O	E
	356+00	0.24	0.20	63.7m 5/6	17	25	.002	3.0	3.0	.045	1.85	3.32	1,900	I	O	E
	361+00	0.43	0.54	"	41	22 7/	.002	4.0	2.4	.045	1.79	3.21	900	I	O	E
Lat. 32 M	326+00	0.03	0.03	111.9m 5/6												
	349+00	0.11	0.11	"	18	25	.002	3.0	3.0	.045	1.85	3.32	2,000	I	O	E
	356+00	0.16	0.16	"	24	25	.002	3.0	3.0	.045	1.85	3.32	600	I	O	E
Lat. 32M-1	336+00	0.01	0.01	111.9m 5/6												
	349+00	0.04	0.04	"	8	15	.0007	3.0	3.0	.045	1.10	1.99	1,100	I	O	E
Lat. 33 M	268+00	0.12	0.12	111.9m 5/6												
	285+00	0.12	0.12	"	34	36	.002	4.0	3.2	.045	2.02	3.64	1,700	I	O	E
	313+00	0.55	0.55	"	67	66	.0007	6.0	4.6	.040	1.73	2.77	4,200	II	M(1955)	I
	345+00	1.27	2.15	"	123	123	.0005	10.0	5.4	.040	1.77	2.83	7,300	I	O	I
Lat. 35 M	243+00	0.01	0.01	63.7m 5/6												
	250+00	0.08	0.08	"	8	10	.0003	3.0	3.0	.045	0.72	1.29	800	I	O	E
	275+00	0.24	0.20	111.9m 5/6	29	29	.0018	3.0	3.4	.045	1.84	3.31	1,500	II	M(1972)	E
	293+00	0.36	0.32	"	43	38	.001	4.0	4.0	.045	1.58	2.83	2,300	II	M(1955)	E
	313+00	0.43	0.39	"	51	52	.001	5.0	4.0	.040	1.86	2.99	2,400	II	M(1955)	E

TABLE 3 - STRUCTURE DATA - CHANNELS

Mill Branch Watershed, Georgia

Channel (No. or Name)	Sta. or Reach (ft)	Watershed Area (SqMi)	Equiv. Drainage Area (SqMi)	Required Drainage Curve	Capacity cfs		Hydraulic Gradient (ft/ft)	Channel Dimensions 2/		"n" Value	Velocities		Excavation (CuYds)	Type of Work 4/	Before Project	
					Req'd	Design		Bottom (ft)	Depth (ft) 1/	Aged 3/	Aged (ft/sec)	As Built (ft/sec)			Type of Channel	Flow Condition 5/
Lat. 36 M	266+00	0.03	0.03	111.9m 5/6												
	275+00	0.04	0.04	"	8	11	.0004	3.0	3.0	.045	0.83	1.45	800	I	0	E
Lat. 37 M	383+00	0.05	0.05	63.7m 5/6												
	410+00	0.23	0.23	"	19	21	.0015	3.0	3.0	.045	1.59	2.87	2,500	I	0	E
Lat. 39 M	449+00	0.04	0.04	63.7m 5/6												
	495+00	0.27	0.27	"	21	17	.002	4.0	4.0	.045	0.7	1.26	7,000	I	0	E
Lat. 41 M	453+00	0.1	0.1	63.7m 5/6												
	486+00	0.24	0.24	"	20	21	.0015	3.0	3.0	.045	1.59	2.87	3,000	I	0	E
Lat. 42 MA	558+00	0.04	0.04	63.7m 5/6												
	570+00	0.06	0.06	"	6	25	.002	3.0	3.0	.045	1.84	3.32	1,700	I	0	E
Lat. 43 M	574+00	0.06	0.06	63.7m 5/6												
	608+00	0.28	0.28	"	22	22	.0015	3.0	3.0	.045	1.59	2.87	4,400	I	0	E
Lat. 44 M	541+00	0.34	0.34	12.7m 5/6												
	557+00	0.51	1.11	"	14	14	.002	3.0	3.0	.045	1.84	3.32	2,400	I	0	E
	588+00	0.80	0.45	63.7m 5/6	33	33	.002	4.0	3.0	.045	1.97	3.55	4,800	I	0	E
	616+00	1.20	0.71	"	48	48	.001	5.0	4.0	.040	1.86	2.99	4,900	I	0	I
Lat. 46 M	555+00	0.02	0.02	63.7m 5/6												
	570+00	0.12	0.12	"	11	25	.002	3.0	3.0	.045	1.85	3.33	1,900	I	0	E
	588+00	0.27	0.97	12.7m 5/6	12	25	.002	3.0	3.0	.045	1.85	3.33	2,500	0	0	E
Lat. 47 M	521+00	0.04	0.04	63.7m 5/6												
	541+00	0.10	0.10	"	9	25	.002	3.0	3.0	.045	1.84	3.32	1,800	I	0	E
Lat. 48 M	590+00	0.03	0.03	63.7m 5/6												
	602+00	0.13	0.13	"	12	18	.001	3.0	3.0	.045	1.31	2.35	1,500	I	0	E
	623+00	0.33	1.12	12.7m 5/6	14	18	.001	3.0	3.0	.045	1.31	2.35	2,700	I	0	E
	642+00	0.57	1.39	"	17	25	.002	3.0	3.0	.045	1.84	3.32	2,400	I	0	E
Lat. 49 M	628+00	0.13	0.13	12.7m 5/6												
	665+00	0.50	0.50	"	7	10	.00035	3.0	3.0	.045	0.77	1.38	4,300	I	0	E

TABLE 3 - STRUCTURE DATA - CHANNELS

Mill Branch Watershed, Georgia

Channel (No. or Name)	Sta. or Reach (ft)	Water-shed Area (SqMi)	Equiv. Drain-age Area (SqMi)	Required Drainage Curve	Capacity cfs		Hydraulic Gradient (ft/ft)	Channel Dimensions 2/		"n" Value Aged 3/	Velocities		Excava-tion (CuYds)	Type of Work 4/	Before Project	
					Req'd	Design		Bottom (ft)	Depth (ft) 1/		Aged (ft/sec)	As Built (ft/sec)			Type of Channel	Flow Condition 5/
Hog Br.	53+00	0.18	0.18	12.7m 5/6												
	73+00	0.33	0.54	"	8	17	.0009	3.0	3.0	.045	1.24	2.23	1,700	I	O	E
	85+00	0.48	1.25	"	15	17	.0009	3.0	3.0	.045	1.24	2.23	1,100	I	O	E
	123+00	1.03	1.80	"	21	22	.0006	4.0	3.4	.045	1.14	2.05	4,600	I	O	E
	136+00	1.21	0.44	63.7m 5/6	32	29	.0006	4.0	4.0	.045	1.22	2.19	2,000	I	O	E
	151+00	1.27	0.50	"	36	40	.0006	5.0	4.0	.040	1.44	2.31	2,300	I	O	E
Lat. 1 H	44+00	0.03	0.03	63.7m 5/6												
	53+00	0.04	0.04	"	4	25	.002	3.0	3.0	.045	1.85	3.32	800	I	O	E
Lat. 2 H	60+00	0.05	0.05	63.7m 5/6												
	73+00	0.10	0.10	"	9	11	.0004	3.0	3.0	.045	0.83	1.49	1,200	I	O	E
Lat. 3 H	52+00	0.02	0.02	12.7m 5/6												
	85+00	0.15	0.15	"	3	17	.0009	3.0	3.0	.045	1.24	2.23	3,000	I	O	E
Lat. 4 H	102+00	0.01	0.01	63.7m 5/6												
	123+00	0.08	0.08	"	8	14	.0006	3.0	3.0	.045	1.01	1.82	2,400	I	O	E
Lat. 5 H	121+00	0.01	0.01	63.7m 5/6												
	136+00	0.03	0.03	"	3	14	.0006	3.0	3.0	.045	1.01	1.82	1,400	1	O	E
Rigdon Br.	466+00	0.26	0.26	111.9m 5/6												
	479+00	0.31	0.56	63.7m 5/6	39	47	.001	5.0	4.0	.045	1.66	2.98	2,900	I	O	I
	491+00	0.43	4.46	12.7m 5/6	44	47	.001	5.0	4.0	.045	1.66	2.98	2,300	I	O	I
	502+00	1.12	7.32	"	68	82	.00075	9.0	4.0	.040	1.87	2.96	3,100	I	O	I
	527+00	1.80	8.00	"	73	82	.00075	9.0	4.0	.040	1.87	2.96	7,200	I	O	I
	529+00	0.02	8.02	12.7m 5/6	73	45 7/	.00075	9.0	3.0	.045	1.44	2.59	1,000	I	O	I
Lat. 1 R	519+00	0.07	0.07	31.9m 5/6												
	534+00	0.08	0.08	"	7	15	.0007	3.0	3.0	.045	1.09	1.97	1,800	I	O	E
Lat. 2 R	516+00	0.03	0.03	63.7m 5/6												
	528+00	0.16	0.16	"	14	20	.00075	4.0	3.0	.045	1.21	2.18	1,600	I	O	E
Lat. 5 R	330+00	0.02	0.02	111.9m 5/6												
	338+00	0.05	0.05	"	9	12	.0005	3.0	3.0	.045	0.92	1.66	700	I	O	E
	355+00	0.21	0.21	"	30	31	.0015	4.0	3.2	.045	1.75	3.16	1,800	I	O	E
	388+00	0.44	1.33	31.9m 5/6	40	43	.0013	4.0	4.0	.045	1.78	3.20	4,700	I	O	E
	423+00	0.68	1.62	"	47	56	.0013	5.0	4.0	.045	1.88	3.40	5,400	II	M(1970)	I

TABLE 3 - STRUCTURE DATA - CHANNELS

Mill Branch Watershed, Georgia

Channel (No. or Name)	Sta. or Reach (ft)	Water-shed Area (SqMi)	Equiv. Drain-age Area (SqMi)	Required Drainage Curve	Capacity cfs		Hydraulic Gradient (ft/ft)	Channel Dimensions 2/		"n" Value Aged 3/	Velocities		Excava-tion (CuYds)	Type of Work 4/	Before Project	
					Req'd	Design		Bottom (ft)	Depth (ft) 1/		Aged (ft/sec)	As Built (ft/sec)			Type of Channel	Flow Condition 5/
Lat. 5 R (cont'd)	445+00	1.43	3.71	"	103	106	.0013	9.0	4.0	.040	2.4	3.8	5,700	I	0	I
	453+00	1.46	3.74	"	103	102	.0004	15.0	4.0	.040	1.5	2.4	2,900	I	0	I
	468+00	1.80	4.08	"	103	102	.0004	15.0	4.0	.040	1.5	2.4	5,400	I	0	I
Lat. 8 R	375+00	0.04	0.04	$63.7m^{5/6}$												
	388+00	0.08	0.13	$31.9m^{5/6}$	6	18	.001	3.0	3.0	.045	1.30	2.34	1,200	I	0	E
Lat. 10 R	359+00	0.06	0.06	$111.9m^{5/6}$												
	370+00	0.11	0.11	"	18	25	.002	3.0	3.0	.045	1.85	3.32	900	I	0	E
	386+00	0.32	0.32	"	43	44	.002	4.0	3.6	.045	2.13	3.80	1,900	I	0	E
	398+00	0.41	1.67	$31.9m^{5/6}$	48	52	.001	5.0	4.0	.040	1.86	3.00	1,900	I	0	E
	423+00	0.65	1.99	"	56	52	.001	5.0	4.0	.040	1.86	3.00	4,600	I	0	E
Lat. 11 R	384+00	0.02	0.02	$63.7m^{5/6}$												
	398+00	0.06	0.06	"	6	18	.001	3.0	3.0	.045	1.30	2.34	1,400	I	0	E
Lat. 12 R.	375+00	0.05	0.05	$111.9m^{5/6}$												
	386+00	0.11	0.11	"	9	18	.001	3.0	3.0	.045	1.30	2.34	900	I	0	E
Lat. 18 R	491+00	0.53	0.53	$12.7m^{5/6}$												
	501+00	0.56	0.56	"	8	18	.001	3.0	3.0	.045	1.31	2.34	1,000	I	0	E
Lat. 19 R	462+00	0.04	0.04	$63.7m^{5/6}$												
	479+00	0.09	0.09	"	9	14	.0006	3.0	3.0	.045	1.01	1.82	2,000	I	0	E
Lat. 20 R	431+00	0.05	0.05	$63.7m^{5/6}$												
	444+00	0.08	0.08	"	8	22	.0015	3.0	3.0	.045	1.59	2.87	1,400	I	0	E
	454+00	0.21	0.14	"	13	22	.0015	3.0	3.0	.045	1.59	2.87	1,000	I	0	I
	491+00	0.64	0.95	$31.9m^{5/6}$	30	31	.0015	4.0	3.2	.045	1.75	3.15	5,100	I	0	I
Lat. 21 R	429+00	0.01	0.01	$111.9m^{5/6}$												
	444+00	0.09	0.16	$12.7m^{5/6}$	3	18	.001	3.0	3.0	.045	1.31	2.34	1,600	I	0	E
Lat. 22 R	426+00	0.04	0.04	$63.7m^{5/6}$												
	454+00	0.14	0.14	"	13	22	.0015	3.0	3.0	.045	1.59	2.87	2,900	I	0	E

TABLE 3 - STRUCTURE DATA - CHANNELS

Mill Branch Watershed, Georgia

1/ Depth from hydraulic gradient.

2/ All side slopes are 1/2:1 except at major road crossings, where they are 3:1 for aesthetic purposes.

3/ All "As Built" "n" values are 0.025.

4/ I - Establishment of new channel including necessary stabilization.

II - Enlargement of existing channel or stream.

5/ I - Intermittent - continuous flow through some seasons of the year but little or no flow through other seasons.

E - Ephemeral - flows only during periods of surface runoff.

6/ Outlet within bank capacity ranges from 90 cfs to 0 cfs.

7/ Maximum within bank capacity.

8/ Approximately 300 feet of Lat. 15 M is classified as "M" (1972) channel - station 171+00 to 174+00 and Type "II" improvement will apply.

Date April 1976

TABLE 3A - STRUCTURAL DATA

GRADE STABILIZATION STRUCTURES

Mill Branch Watershed, Georgia

Channel Designation	Approximate Station Number	Drainage Area (Sq.Mi.)	Design Capacity (cfs)	Drop (ft)	Type of Structure
Lat. 3B	55+00	.36	28	1.0	Rock
Lat. 20R	476+00	.47	31	2.0	Rock
Lat. 13M	196+00	.06	20	2.0	Rock
Lat. 31M	346+00	.20	25	1.7	Rock
Lat. 33M	295+00	.40	52	1.5	Rock
Lat. 35M	300+00	.40	51	1.5	Rock
Rigdon Branch	466+00	.26	36	2.0	Pipe - Rock[1]
Rigdon Branch	480+00	.40	44	2.0	Rock
Rigdon Branch	491+00	1.10	74	2.0	Rock

1/ Flashboard riser to be installed.

Date: April 1976

TABLE 3B - INVENTORY OF WATERSHED CHANNEL WORK

Mill Branch Watershed, Georgia

Miles	CODE CLASSIFICATION 1/		
	Type of Work	Type of Channel	Flow Condition Prior to Project
9.3	I	O	I
0.3	II	N	I
0.7	II	M (1970)	I
0.5	II	M (1955)	I
0.6	II	M (1972)	E
0.7	II	M (1955)	E
31.3	I	O	E
TOTAL 43.4	-	-	-

1/ Code Classification

Type of Work

I - Establishment of new channel including necessary stabilization.

II - Enlargement of existing channel or stream.

Type of Channel

N - An unmodified, well defined natural channel or stream.

M - (date) Man-made ditch or previously modified channel.

O - None or practically no defined channel.

Flow Condition Prior to Project

I - Intermittent - Continuous flow through some seasons of the year but little or no flow through other seasons.

E - Ephemeral - Flows only during periods of surface runoff.

Date: April 1976

TABLE 4 - ANNUAL COST

Mill Branch Watershed, Georgia

(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation and Maintenance Cost	Total
3 B	798	263	1,061
Little Bear, 1 LB, 2 LB, 3 LB, 4 LB	1,658	548	2,206
Mill Br. 17+00 to 151+00 1 M, 3 M, 4 M, 6 M, 7 M, 8 M, 9 M	5,558	1,793	7,351
Hog Br., 1 H, 2 H, 3 H, 4 H, 5 H	3,310	1,078	4,388
Mill Br. 151+00 to 208+00 10 M, 11 M, 12 M, 13 M, 14 M, 15 M, 16 M, 17 M, 18 M	7,246	2,340	9,586
Mill Br. 208+00 to 347+00 19 M, 20 M, 21 M, 24 M, 26 M, 27 M, 28 M	9,537	3,228	12,765
30 M	350	118	468
31 M, 32 M, 32 M-1	1,947	643	2,590
33 M, 35 M, 36 M	4,041	1,343	5,384
37 M	350	118	468
39 M	970	325	1,295
41 M	436	145	581
42 MA	307	100	407
43 M	547	185	732
44 M, 46 M, 47 M	2,303	773	3,076
48 M	921	308	1,229
49 M	540	183	723
1 R	332	113	445
2 R	227	78	305
5 R, 8 R, 10 R, 11 R, 12 R	6,319	2,008	8,327
18 R, 19 R, 20 R, 21 R, 22 R, Rigdon	5,582	1,857	7,439
Project Administration	6,460	-	6,460
GRAND TOTAL	59,739	17,547	77,286

1/ Price base: 1976

2/ 100 years @ 6 1/8 percent interest.

Date: April 1976

TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Mill Branch Watershed, Georgia

(Dollars) 1/

Item	Estimated Average Annual Damage		Damage Reduction Benefit
	Without Project	With Project	
Floodwater			
Crop and Pasture	64,675	19,402	45,273
Woodland	22,384	6,715	15,669
Road	40,428	12,128	28,300
Subtotal	127,487	38,245	89,242
Indirect	12,749	3,825	8,924
TOTAL	140,236	42,070	98,166

1/ Price base current normalized.

Date: April 1976

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Mill Branch Watershed, Georgia

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/				TOTAL	Average Annual Cost 3/	Benefit Cost Ratio
	Flood Prevention	Drainage					
	Damage Reduction	Improved Efficiency 2/	Redevelopment	Secondary			
3 B	1,056	959	186	723	2,924	1,061	2.8:1.0
Little Bear, 1 LB, 2 LB, 3 LB, 4 LB	3,770	2,946	388	2,444	9,548	2,206	4.3:1.0
Mill Branch 17+00 to 151+00							
1 M, 3 M, 4 M, 6 M, 7 M, 8 M, 9 M	13,110	6,517	1,270	5,000	25,897	7,351	3.5:1.0
Hog Branch, 1 H, 2 H, 3 H, 4 H, 5 H	8,358	4,498	763	3,070	16,689	4,388	3.8:1.0
Mill Branch 151+00 to 208+00							
10 M, 11 M, 12 M, 13 M, 14 M, 15 M, 16 M, 17 M, 18 M	14,148	5,663	1,675	3,358	24,826	9,586	2.6:1.0
Mill Branch 208+00 to 347+00							
19 M, 20 M, 21 M, 24 M, 26 M, 27 M, 28 M	12,108	9,806	2,286	6,794	30,994	12,765	2.4:1.0
30 M	1,028	535	84	387	2,034	468	4.3:1.0
31 M, 32 M, 32 M-1	4,265	1,777	456	1,165	7,663	2,590	3.0:1.0
33 M, 35 M, 36 M	8,077	5,843	950	4,552	19,422	5,384	3.6:1.0
37 M	1,099	999	84	871	3,053	468	6.5:1.0
39 M	1,395	669	230	375	2,669	1,295	2.1:1.0
41 M	1,686	1,533	103	1,361	4,683	581	8.1:1.0
42 MA	332	303	71	197	903	407	2.2:1.0
43 M	894	413	131	230	1,668	732	2.3:1.0
44 M, 46 M, 47 M	5,92	4,785	548	3,943	15,201	3,076	4.9:1.0
48 M	2,097	1,906	218	1,604	5,825	1,229	4.7:1.0
49 M	1,206	1,096	130	865	3,297	723	4.6:1.0
1 R	202	184	80	81	547	445	1.2:1.0
2 R	1,071	374	55	285	1,785	305	5.9:1.0
5 R, 8 R, 10 R, 11 R, 12 R	10,799	5,918	1,451	3,738	21,906	8,327	2.6:1.0
18 R, 19 R, 20 R, 21 R, 22 R, Rigdon	4,640	4,217	1,286	2,706	12,849	7,439	1.7:1.0
Project Administration	---	---	---	---	---	6,460	---
GRAND TOTAL	97,266 4/	60,941	12,427	43,749	214,383	77,286	2.8:1.0

1/ Price Base: Agricultural Products - Current Normalized; Others 1976
2/ Represents reduced production cost, improved quality plus increases in production.
3/ From Table 4.
4/ In addition it is estimated land treatment measures will provide flood prevention benefits of $900 annually.

Date: April 1976

INVESTIGATIONS AND ANALYSES

Land Use and Treatment

Present land use and status of conservation treatment was tabulated from work unit records, progress reports, conservation needs inventories, and individual schedules. Data was consolidated into tabular form indicating land use by land capability classes. Agricultural census reports were used by federally employed local agricultural workers, the Georgia Forestry Commission, and Watershed Association members to predict future land use by capability class.

Planning staff members, field office personnel, and area Soil Conservation Service personnel studied cover conditions and erosion on open land. A systematic field survey showed ground cover, forest, and hydrologic conditions and treatment needs in forest land areas. These surveys and studies, supporting data, and information from other agencies, and forestry officials determined what remedial measures would be necessary to stabilize soil. Approximately 500 acres of clean-tilled cropland are in land capability Class IIe with an allowable soil loss of 4 tons per acre annually. Average annual soil loss from this land under continuous row cropping without conservation practices is about 11 tons per acre. Average annual soil loss after adequate land treatment consisting of terraces, grass waterways, and conservation cropping systems is less than one-half ton per acre (Soil Loss Prediction for Georgia, 1963). Land treatment goals for cropland have been established to adequately treat 71 percent of untreated land subject to erosion during the installation period.

A systematic field survey of the forest land showed ground cover, forest conditions, and conservation land treatment needs. This survey, supporting data, and information from other forestry officials determined what remedial measures should be taken. Forestry benefits were determined for areas influenced by the water management system. These were determined by reaches and acres of soil associations in these reaches.

Fish and Wildlife

A reconnaissance survey to determine fish and wildlife resources and future development was made by biologists representing the Bureau of Sport Fisheries and Wildlife, Georgia Game and Fish Division and the Soil Conservation Service. A representative of each agency presented a report of his findings at a public meeting attended by the sponsors and a majority of landowners. Recommendations of the study group have been incorporated into the plan. No open channel construction on the main stem was planned downstream from Highway 64 where a low value stream fishery was identified.

Hydraulic and Hydrologic

A composite runoff curve number for the watershed was calculated using the hydrologic groupings of the soils and soil cover complex data. Multiple purpose channel capacities were computed using the following data:

1. Rainfall from Weather Bureau Technical Paper No. 40.
2. Degrees of protection as follows:

a.	Truck and specialty crops, rural residential yards, gardens, and related areas:	Removal of runoff from a 5-year frequency, 24-hour duration rainfall in one day.
b.	Crops:	Removal of runoff from a 2-year frequency, 24-hour duration rainfall in one day.
c.	Pasture:	Removal of runoff from a 2-year frequency, 24-hour duration rainfall in two days.
d.	Forest land:	Removal of runoff from a 2-year frequency, 24-hour duration rainfall in five days.

3. Formula for coefficients for surface drainage $Q = CM^{5/6}$.

Q = required capacity of the channel in cfs.
C = a coefficient related to the characteristics of the watershed and the magnitude of the storm against which the watershed is to be protected.
M = drainage area in square miles.

The following coefficients were computed:

Truck and specialty crops, rural residential yards, gardens, and related areas.	111.9
Crops	63.7
Pasture	31.9
Forest land	12.7

Changes in water surface elevations due to proposed channel work have been calculated using surveyed cross sections on Big Branch near the watershed outlet. Peak discharges were determined by regional analysis.

Changes in water surface elevations are shown below.

Frequency of Occurrence	Change in Water Surface Elevation
1 - year	+ 0.3 foot
2 - year	+ 0.3 foot
5 - year	+ 0.3 foot
10 - year	+ 0.2 foot
50 - year	+ 0.2 foot

Engineering

Vertical control was established along drainageways and proposed water control systems using mean sea level datum. Distance between surveyed cross sections, control points, and fixed improvements were measured from aerial photographs and composite base maps produced by photographic methods. Channel stationing was developed from the top of the watershed in a downstream direction.

Channel designs were based on an as-built "n" value of .025 and as-built velocities at or below the maximum allowable for the type soil in which the channels are to be located. A comparison of the channel work planned for Mill Branch Watershed was made with the Ahoskie Creek, North Carolina channel improvement on which a detailed comparability study has been made.

The Mill Branch Watershed is in the coastal plain area of applicability to Ahoskie Creek. Soils are similar, and better, from the engineering standpoint, being mostly SM and SC.

Vegetation will be established quicker. Plans will require seeding and fertilizing daily during construction.

The aged-condition velocity will range from 0.65 to 2.69 ft./sec. It was concluded in the Ahoskie study that an aged-condition mean velocity of 3.2 ft./sec. is a safe design parameter.

The channel slopes will vary from 0.0001 to 0.002 ft./ft. Where channel slopes are steeper than allowable, rock structures and/or pipe drops will be used to reduce the grade. Cost estimates are approximately equal for either type of structure. A combination rock-pipe structure on Rigdon Branch will utilize asphalt-coated corrugated metal pipe (Table 3A).

Drainage areas vary from 0.01 to 7.31 square miles which are small in comparison to Ahoskie which varied from 3.9 to 75.24 square miles.

The minimum depth and bottom width used was three feet, except in outlet sections of channel. This minimum is considered to be necessary for adequate maintenance, although this size channel provides a capacity greater than necessary for the level of protection needed for some areas.

The size of road culverts involved in channel excavation was based on the minimum pipe size that will discharge the design Q for respective channel stations, as shown in table entitled "Structural Data - Channels." The design head loss through culverts has been held to 1.0 foot or less. These "Q's" are based on removing the runoff from a 24-hour storm in 1 to 5 days, dependent on level of protection needed. Protection of roads against greater storm runoff would be contingent on increased head loss and/or larger culvert size.

Preliminary channel design was in accordance with SCS Engineering Memo-72.

Geology

In areas of planned channel work, soil samples were collected and analyzed in order to determine representative plastic indices and grain size distribution. To facilitate collection of samples, channel sites were divided into increments based on location within given soils mapping units. Investigations were sufficient to determine average conditions within these mapping units. These soils data were then applied toward criteria for design of channel banks and bottom.

Soil survey maps were used to assist in identifying soil types in areas of proposed construction. Characteristics and behavior of the various soil types are well known due to experience in PL-46 and PL-566 work over a long period of time in the Coastal Plain.

Many aged man-made canals in similar soils in the watershed and immediate vicinity were examined and found to be in good condition with native vegetation doing an excellent job of stabilization. Little if any change in cross section capacity was evident. Cross sections in most areas observed have assumed a somewhat parabolic shape due to the characteristics of soils such as Leon, Pelham, Plummer, and Rains, which are described in the Physical Data section. During construction high water tables, sometimes approaching surface water conditions, contribute to this re-sectioning process. The rate of re-sectioning decreases almost immediately after construction as the water table immediately adjacent to the channel subsides, and re-sectioning continues to lessen as the channel ages and natural vegetation becomes established. These soils are well intergrated with woody materials from a dense root system.

Construction of agricultural and pine forest land drainage facilities through these soil types has been practiced over a long period of time in the watershed and in other Coastal Plain counties. Construction techniques that have evolved over the years minimize construction problems and stability concerns. Some of the tried and proven techniques to be used in this project are designing and planning for this inevitable parabolic cross section by over-excavating to allow the inflow material from side slopes to be deposited in the channel bed where it remains; leaving the tree canopy undisturbed on one side; and constructing sediment traps at lower ends of mains and laterals to intercept any sediment produced by construction activities prior to establishment of bank vegetation.

Several recent inspections of Coastal Plain channel work have been made by State, E&WP Unit, and Washington Office SCS personnel including; geologists, engineers, hydrologists, and agronomists. Results of re-sectioning into parabolic cross sections and natural revegetation were observed. These inspection teams have observed project channels and others installed by landowners in the immediate vicinity of the project.

Economics

Basic data used in economic investigations and analyses of this project were obtained from work unit technical guides, soil surveys, and Department of Agriculture publications. Interviews were held with local farmers, local agricultural workers, county officials, University of Georgia personnel, representatives of U.S. Forest Service, Georgia Forestry Commission, and American Pulpwood Association.

Current normalized prices were used in all benefit computations, and for operation and maintenance costs. For installation, 1976 costs were used. Costs for all structural measures were amortized over a 100-year period at 6 1/8 percent interest.

Flood prevention and drainage benefits accruing to benefitted soil types on areas served by multiple purpose channels were evaluated on 2,587 acres of crop and pastureland. Crop and pasture benefits were taken as the difference in net returns without the project and estimated net returns with the project. Of the 2,587 acres of crop and pastureland, 285 acres is in improved pasture, and 388 acres is in temporary grazing.

Benefits to forest land were derived for each construction unit by determining the differences in potential yield of forest products both with and without the proposed project. Based on forest sampling data gathered within the project area and in similar adjacent areas, the potential site quality was derived and used as the basis for computing increases in forest product volume for each soil type. Current market conditions, management practices, and interest rates were used in computing returns. All forest land benefits were adjusted for landowner participation before inclusion in the work plan.

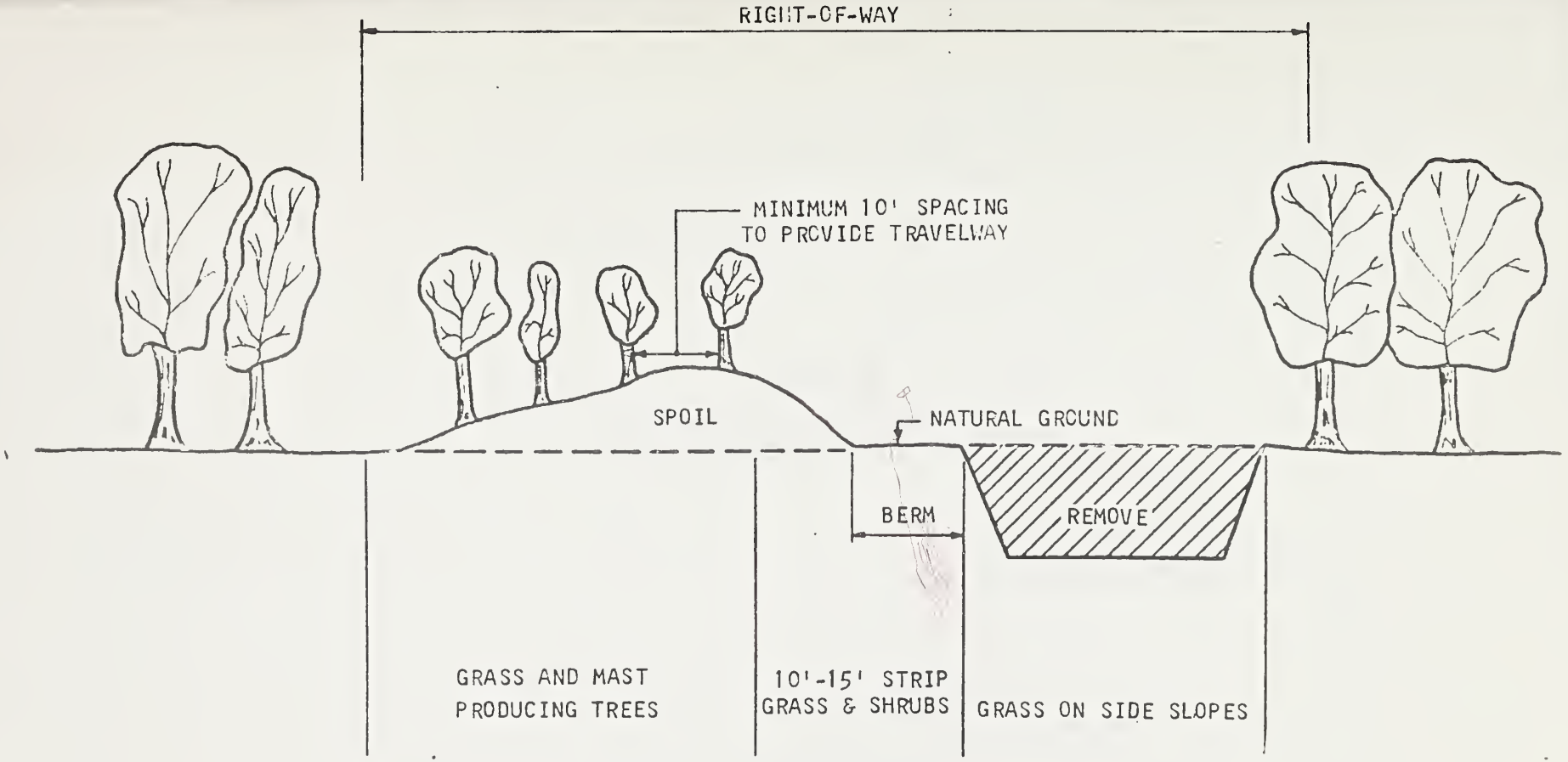
Benefits accruing to multiple purpose channels were allocated to flood prevention and agricultural water management in the same ratio as costs were allocated (50 percent flood prevention and 50 percent agricultural water management).

Benefits to roads were estimated by subtracting anticipated maintenance cost without project from anticipated maintenance cost with project. These benefits amounted to $28,300.

Indirect damages were estimated to be 10 percent of direct floodwater damages. These benefits amounted to $8,924.

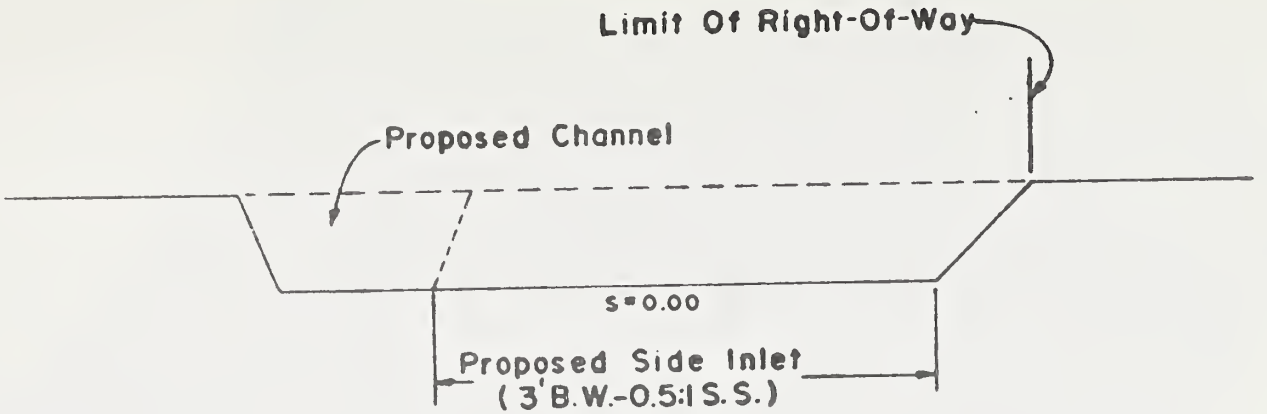
In computing redevelopment benefits, 20 percent of construction cost and 50 percent of maintenance cost was estimated to be used for hiring local labor. Benefits stemming from local labor used in O&M were estimated to decrease to zero within a 20-year period. These benefits were estimated to be $12,427.

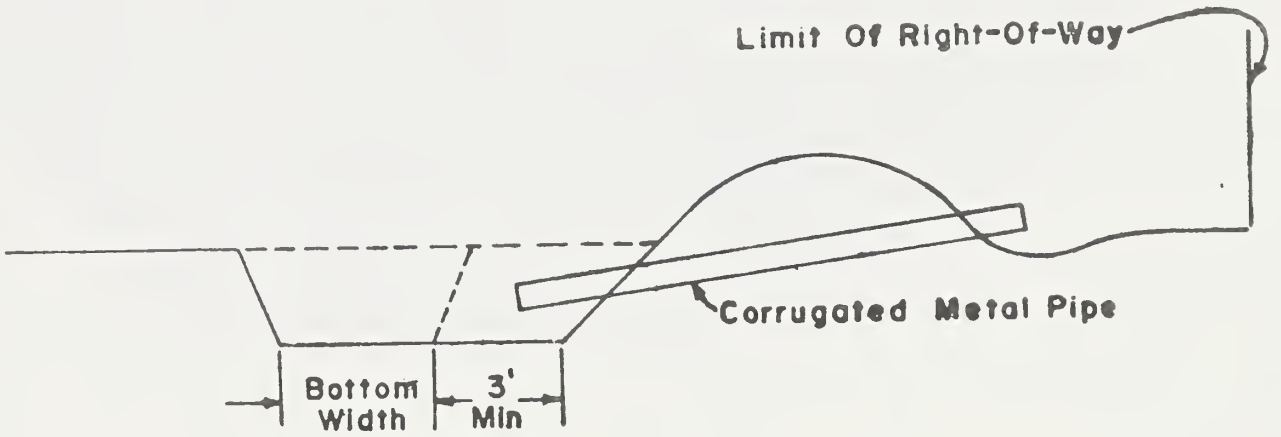
Secondary benefits stemming from the project were estimated by the use of an income multiplier. The multiplier used in this analysis was obtained from an input - output study for Georgia entitled Georgia Economic Model. This study was directed by Dr. William A. Schaffer, an Associate Professor of Economics at Georgia Institute of Technology, and was made for the Georgia Department of Industry and Trade. The income multiplier used reflects the increased net returns which result from the economic activity stimulated by production, utilization and disposition of intermediate goods and services, and by consumer spending of wages and income earned from direct and indirect activity created by the project. The ratio of the total economic activity generated to the initial economic activity is the multiplier. Benefits estimated in this manner amount to $43,749.



TYPICAL CHANNEL SECTION

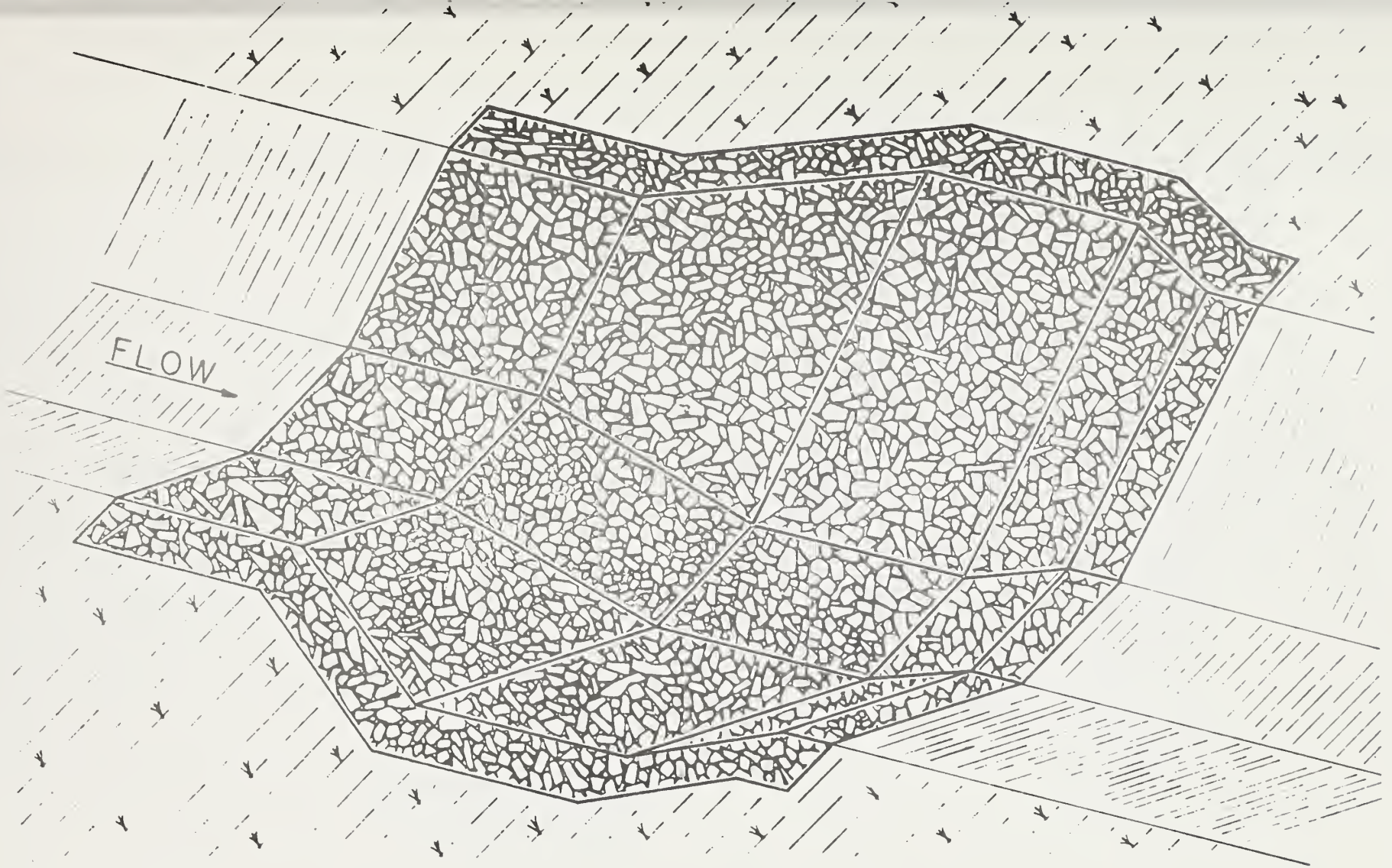
FIGURE 1





TYPICAL PROFILES OF SIDE INLETS

FIGURE 2



TYPICAL ROCK STABILIZATION STRUCTURE
FIGURE 3

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

LEGEND

- Poved Road
- Improved Road
- Unimproved Road
- (4) State Highway
- (23) U.S. Highway
- City Boundary
- Railroad
- Drainage
- Watershed Boundary
- Open Channel - Flood Prevention and Drainage
- Fixed Improvements to be Altered Because of Planned Structural Measures

STRUCTURAL MEASURES MAP

MILL BRANCH WATERSHED

BACON COUNTY, GEORGIA

0 1

Approximate Scale - Miles

Base compiled from uncontrolled mosaic No. 4-FI-28811 and latest available General Highway Maps. All planimetric features latitude and longitude taken from these sources.

SOURCE Data compiled by SCS Watershed Planning Staff

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Formerly 2-5-9221 Rev 3-72

4-R-28812

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

LEGEND

- Paved Road
- Improved Road
- Unimproved Road
- 4 State Highway
- 23 U.S. Highway
- City Boundary
- Railroad
- Drainage
- Watershed Boundary
- Open Channel-Flood Prevention and Drainage
- Area Benefited

82°30'

31°35'

31°30'

ALMA

Hog Branch

Mill Branch

Bear Branch

Little Bear Branch

Coast Line

Atlantic Coast Line

Airport

Cobb Branch

Burnt Cobb Branch

Lat 1H
Lat 2H
Lat 3H
Lat 4H
Lat 5H
Lat 6H
Lat 7H
Lat 8H
Lat 9H
Lat 10H
Lat 11H
Lat 12H
Lat 13H
Lat 14H
Lat 15H
Lat 16H
Lat 17H
Lat 18H
Lat 19H
Lat 20H
Lat 21H
Lat 22H
Lat 23H
Lat 24H
Lat 25H
Lat 26H
Lat 27H
Lat 28H
Lat 29H
Lat 30H
Lat 31H
Lat 32H-1
Lat 33H
Lat 35H
Lat 36H
Lat 37H
Lat 38
Lat 39H
Lat 41H
Lat 42H-A
Lat 43H
Lat 44H
Lat 45H
Lat 46H
Lat 47H
Lat 48H
Lat 49H
Lat 1B
Lat 2B
Lat 3LB
Lat 4LB
Lat 1R
Lat 2R
Lat 3R
Lat 5R
Lat 6R
Lat 8R
Lat 10R
Lat 11R
Lat 12R
Lat 18R
Lat 19R
Lat 20R
Lat 21R
Lat 22R

PROJECT MAP

MILL BRANCH WATERSHED
BACON COUNTY, GEORGIA

0 1

Approximate Scale - Miles

Base compiled from uncontrolled mosaic No. 4-R-28811 and latest available General Highway Maps. All planimetric features latitude and longitude taken from these sources

SOURCE Data compiled by SCS Watershed Planning Staff.

REVISED MARCH 1976 4-R-31484